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The 30-Hour Week—A Poor Risk

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Despite the claims of some interpreters of economic trends, there is no evidence that machine use has caused unemployment — or that shorter working hours will prove effective in raising real wages

THE INSISTENCE of labor leaders that a 30-hour week law be passed by the new Congress reopens an issue of concern to machinery manufacturers in two ways:

1. The whole philosophy of this measure, pro and con, is intimately related to problems of machine production;

2. The plan would impose heavy penalties not only upon the managements but upon the workers of this industry.

The theory of the proposed new commandment, "five days shalt thou labor and six hours per day," is insidiously simple. It is too simple. Panaceas, somehow, are likely to make good sales talk and bad medicine.

One of the main props of the plan seems to be that mechanization has caused a displacement of labor which will tend to be permanent unless offset by some artificial means. According to William Green, president of the American Federation of Labor and principal champion of shorter hours, "the strange paradox of increasing unemployment" in the booming '20s was because the "workers were being displaced continually through the introduction of mechanical equipment."

If machinery manufacturers could accept this as the true picture, there might be some merit in considering one of the two correctives which suggest themselves—either limitation of machine output or, as Mr. Green suggests, the spreading of available work through shorter hours. But most members of the industry will be hard to convince that mechanization really was a large factor toward unemployment; quite the reverse, in fact. If one of Mr. Green's major premises fails, considerable doubt may be cast upon the theoretical soundness of the whole plan, even before dealing with the practical difficulties which stand in the way of its operation.

An Old Fallacy

That mechanization displaces labor is the same old argument that has been raised, in one form or another, ever since the machine age began with the first spinning jennies and power looms. Labor has said it; single-track economists have said it; and the group who called themselves "Technocrats" briefly joined the hue and cry. Labor's answer to the spinning jenny was brickbats. To modern machinery, it is the 30-hour week. But invariably each new invention has advanced the status of labor as it has added to national wealth, on up to the automobile, the broad effect of which is too obvious to bear mention.

Mr. Green's paradox is not difficult to explain. Of course, the evidence of unemployment increased during the boom. There were more short-term jobs — construction projects ending; rush orders being filled. The turnover in labor floating between jobs naturally involved more men as industrial activity expanded.

The boom also brought in a good many unskilled people who hitherto had found subsistence in rural areas and were not all suited to industrial purposes. The misfits were thrown into the marginal drift between employment and unemployment.

So why blame the machine? Spectacular examples of the apparent displacement of men by machines do not reveal the quiet, underlying trend whereby mechanization has created a spread of employment in broadening circles beyond the industry immediately affected.

Theodore Roosevelt, according to one of the Roosevelt legends, once made the answer pretty plain to a labor leader who wanted the Panama Canal dug with hand shovels instead of steam shovels for the sake of employment. As the story goes, he said:

"If your theory is correct, why not

dig it with spoons and give everybody a job?"

This new variant, which would spread work through shorter hours rather than by throttling the machines, has the effect of doling out spoonfuls of labor to industry. Whether one limits hours, or production, or raw materials, the plan is essentially the "economy of scarcity" idea, regarding which there has been a widespread shift of thought lately toward the principle of an "economy of plenty" for which the power-driven machine is the base. There is room for considerable doubt that the consumptive needs of this country could be produced in "plenty" under a 30-hour week.

It is a law of mechanics that the internal forces within a system add up to a sum total of zero. This is why schemes for perpetual motion and perpetual prosperity that look so simple on paper are nullified by factors not in the original reckoning.

Supposing that the unemployed really could be absorbed under the plan without depressing the income of those now employed, labor would not necessarily benefit. The working of the plan, as Mr. Green proposes, would increase payrolls, and therefore, production costs. Prices also would rise and the real purchasing power of labor as a whole would not necessarily advance.

If real purchasing power did not increase, the total of consumption would tend to remain stationary. Wider distribution of wages might tend to increase the demand for goods in the lower value brackets but would be likely to impair sales of higher-priced items—automobiles and washing machines, for example—for reasons which will be stated a little later.

The need for relief would be mostly wiped out by full success of the plan. In other words, labor would pay the relief bill. Men now employed would be penalized by their efficiency and their ability to hold jobs. Under the plan, the cash wages of present workers would not increase and their real wages would diminish if prices rose. They would be bearing the cost of giving jobs not alone to the worthy unemployed but to the misfits and near-unemployables.

Who Pays the Bills?

Superficially, it might appear that managements would bear the expense. But how can they in these days of profitless production and tight credit? Still assuming that payrolls are increased under the plan, without which the process is merely spreading work and of very limited effect upon the general economic situation, managements would have to take drastic steps to curtail costs.

In absorbing new men into their plants under the shorter working week, they would be able to tighten up their operating schedules so that the full theoretical gain in employment would not be realized. The number of man-hours, in other words, would be less. Advocates of the measure are admitting this when they say that operations are more efficient under shorter hours.

More Plant Mechanization

Toward a further reduction of costs, managements would be compelled to mechanize their plants more than heretofore and to improve the efficiency of present installations—a gain to the machinery industry, perhaps, but one likely to be offset by losses elsewhere in the plan. Labor, in its struggle against the machine, sees machinery as a labor-saving device. But, to employers, it is merely an instrument toward lower unit costs. Machinery is installed only when there is reason to believe it will pay as against hand methods or less efficient machinery. The forcing of mechanization under depressed conditions is quite a different matter from natural development in boom times and may indeed displace labor, from a short-term outlook, at least.

Such costs as cannot be offset through higher efficiency will be charged through to the ultimate consumer. Labor's capacity to consume is immediately impaired by higher prices which, in turn, will tend to inhibit production and employment by discouraging sales and accentuating the fluctuations in demand. If automobiles become more costly, families will figure on driving their old cars a little longer. Higher priced washing machines will keep the housewife at the washboard.

It is suggested above that even if payrolls increased, labor would not necessarily derive much benefit. But there is no assurance that payrolls would increase, in which case labor obviously would lose.

As the plan stands, it is proposed that workers be paid for a 30-hour week the same wages they are now receiving for 40 hours or 44 hours or 50 hours or whateve they happen to be working. If this were forced upon managements, those working their men the longest hours would be most heavily penalized.

The whole relationship as to competitive advantage between different plants would be upset, with repercussions upon our entire business structure. Small firms would be hard hit because this rigid rule would remove one of the elements of flexibility whereby they are able to stay in business and contribute to economic stability. Larger firms, through size alone, would find it easier to stagger shifts and adapt to new schedules.

It seems doubtful, however, that employers could be forced to pay the same for 30 hours as for the longer week. Some might be induced to make upward adjustments. But on the whole, the plan merely would result in the spreading of work. As indicated above, workers now employed would be sharing not only their work but their income with the unemployed.

If legislative compulsion were attempted, many employers would be obliged to offset part of the cost by reducing wages of employees in the higher brackets. A minimum wage tends also to become a maximum wage. The whole trend would be toward increasingly unsatisfactory relations between employers and labor.

Large Groups Exempt

Large groups of workers—agriculture, service groups, many of the small stores and plants, workers on a commission basis, etc., would be out of reach of the law. Firms not engaged in interstate commerce are not within Federal jurisdiction. Others would seek to evade the law, and doubtless in many cases, the workers would abet them in order to maintain their income by working long hours. Enforcement would be about as difficult as in the late prohibition experiment.

On the whole, therefore, the plan would affect mainly the manufacturing industries which cannot be expected to wipe out all the unemployment by any amount of work-spreading thus far proposed. Through the depression, many of the plants have carried their forces on very short hours, and the 30-hour plan cannot add to employment when applied to workers already on 30 hours or less.

Returning to the effect on goods in the higher value brackets, it may be seen that increased prices would discourage sales on one hand and, on the other, reduction of the income of those

now employed, to spread among the unemployed, would reduce the income of the average worker and thus reduce his capacity to buy beyond necessities and cheaper commodities.

Higher prices would inhibit our ability to export and would encourage imports. Wages to new employees would go partly into the payment of debts with a corresponding lag in consumption. In short, the several factors which have been outlined would tend to combine toward a lower volume of business at a time when a set-back is most to be avoided.

Inadaptable to Machinery Makers

Putting the plan into practice would be particularly difficult among makers of machinery and allied products. The use of man-power, as and when needed, is essential to the work of this industry. Few machinery firms are able to stabilize their output because of seasonal factors and because it is imposible to anticipate the nature and volume of orders much in advance. For the majority of our firms, this means a succession of slack periods followed by spurts of activity during which it is necessary to work long hours to fill an order right and on time.

Not too many of the workers in machine-using trades need ask for the leisure time which is held out to labor as one of the desirable features of the 30-hour week. Our people have had more than they want of it during the frequent dull periods over the past five years. A rush order gives them an opportunity to work long hours and make up in part for the lean pickings that went before. If their fluctuating work were held to a maximum of 30 hours, it would be most difficult under present conditions for these workers to make anything near a fair annual income, even assuming some upward adjustments in rates.

It would be difficult, too, for some plants to find enough skilled labor to meet rush periods. Obviously, much of the work of machinery manufacturing firms is highly specialized, and a long training period is required before the men become proficient. There is a shortage of skilled labor in manufacturing centers and many plants within the industry are scattered. Delay and expense would be entailed in importing men. Newcomers hired for temporary rush purposes would not necessarily stand to gain by transplanting themselves and their families.

The above points suggest only a few of the reasons why the 30-hour plan seems a dangerous experiment either in theory or in practice. Detailed statistics and the records of experience in this and other countries may be offered to swell the weight of evidence.

But a further point which gravitates against the plan is that added legislation is not needed. The authority which Congress has granted the NRA is sufficient for reasonable steps toward the measure which Mr. Green proposes, and this power already has been used liberally in shortening hours and upping wages. Under NRA, the conditions within each industry have been considered. Both managements and labor have been heard. It has been possible to determine what can ben done and what can not be done on the principle of the greatest good for the greatest number. This is vastly different from laying down an iron-clad rule upon all industry.

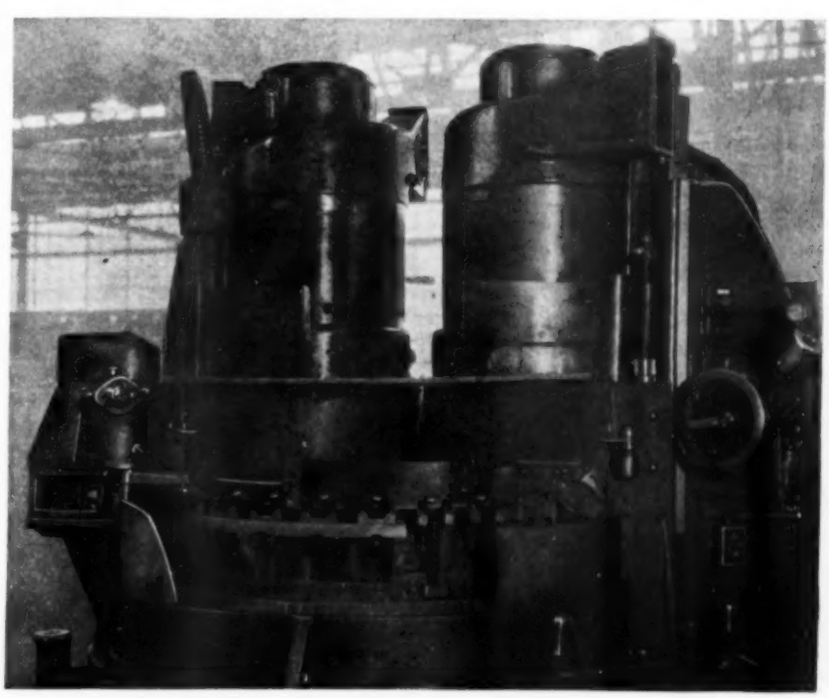
Do what we will, labor is a commodity. Its use and its price in relation to other commodities are fixed by the law of supply and demand which in turn is responsive to factors of such complexity as not to be understood fully even by our best minds. To attempt readjusting the present economic equation by a single-track line of approach may seem the easy way in theory but in practice it is likely to be the hard way.

To sum it up, if the plan were made effective in terms of employment and payrolls, prices would advance and labor would not be much better off in terms of real wages. If, as seems more likely, employment and payrolls failed to respond to the extent which Mr. Green anticipates, labor would lose; business would lose; the nation would lose. It is too risky a plan to commend itself under present conditions.

Plymouth Rod and Cap Joints

Removing metal by grinding, from the rough forging to the finish dimension, is accomplished on the Blanchard grinder shown. This is at work on connecting rods and caps in the plant of the Plymouth Motor Car Co. The rods are forged very close to size, the roughing removing only about 0.025 in. for the finishing wheel. More metal could be removed with slowing down the operating time but the quality of the forgings makes it unnecessary.

Each wheel is controlled by the type of caliper that was developed by the maker sometime ago. This maintains a very close tolerance, the distance from the center of the piston pin hole being held within 0.002 inch, plus or minus. Convenient holding fixtures enable the two operators to handle 550 rods and caps per hr. A similar machine grinds both sides at an equal rate.



Each wheel is driven by a 30-hp. motor. Buttons at the right control all except the wheel-raising motors

Helical Gears for the Nash Transmission—II

In the first article on the Nash transmission, operations on the countershaft gear and the clutch shaft were described; a similar account follows for three of the remaining parts

MACHINING operations on the drive shaft start in much the same way as for the clutch shaft. Ends are milled to length and centered; the part is set up in a Fay lathe on live centers, gripped in an automatic driver for turning and facing. As in the case of the clutch shaft, the small end is machined with a circular forming tool.

After facing and cutting the shoulders to length in a LeBlond engine lathe, the rear end is drilled, tapped, and recentered in a Warner & Swasey machine with the work supported in a roller steady seat. Using a chuck to drive and true up the part, first the rear spline and then the 25-tooth spline are cut in Lees-Bradner hobbers. The helical spline is checked for size in a fixture using a ball point indicator.

Norton machines are employed to green grind the outside diameter of the helical spline and the pilot. The larger surface then serves as a chucking diameter for cutting the 18-tooth spline, which operation immediately follows. For this operation, the shaft is set up in a three-jaw, cam-operated chuck on the work spindle of a Fellows' gear shaper with the upper end supported in a center from a standard arbor support attachment. Accuracy is checked with a dial indicating fixture.

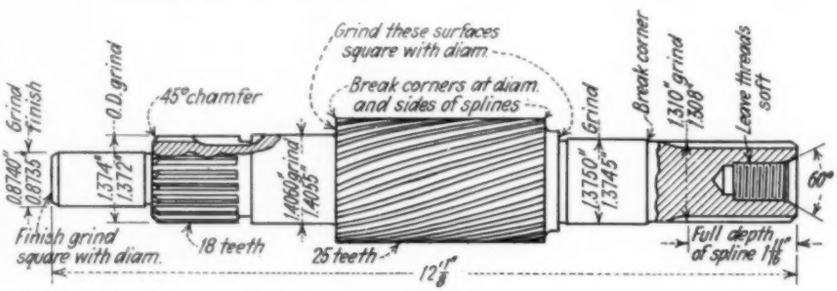
A keyway is machined between the spline teeth by means of a U. S. hand mill, using a locating fixture to position the work correctly. The splines are then given a pin test for run-out.

After cleaning, burring and inspecting, the shaft goes to the heat-treating department. When it returns both centers are cleaned with emery cloth in a Henry & Wright vertical drill, and then the shaft is straightened. As this part is fairly rigid, a No. 4 Toledo press is used.

All outside diameters are finished ground in Norton machines, using the end spline for driving. The end of the shaft is ground to length in a rotating fixture which supports the work from two of the finished outside diameters. The center spline is ground to length, and the bearings are polished.

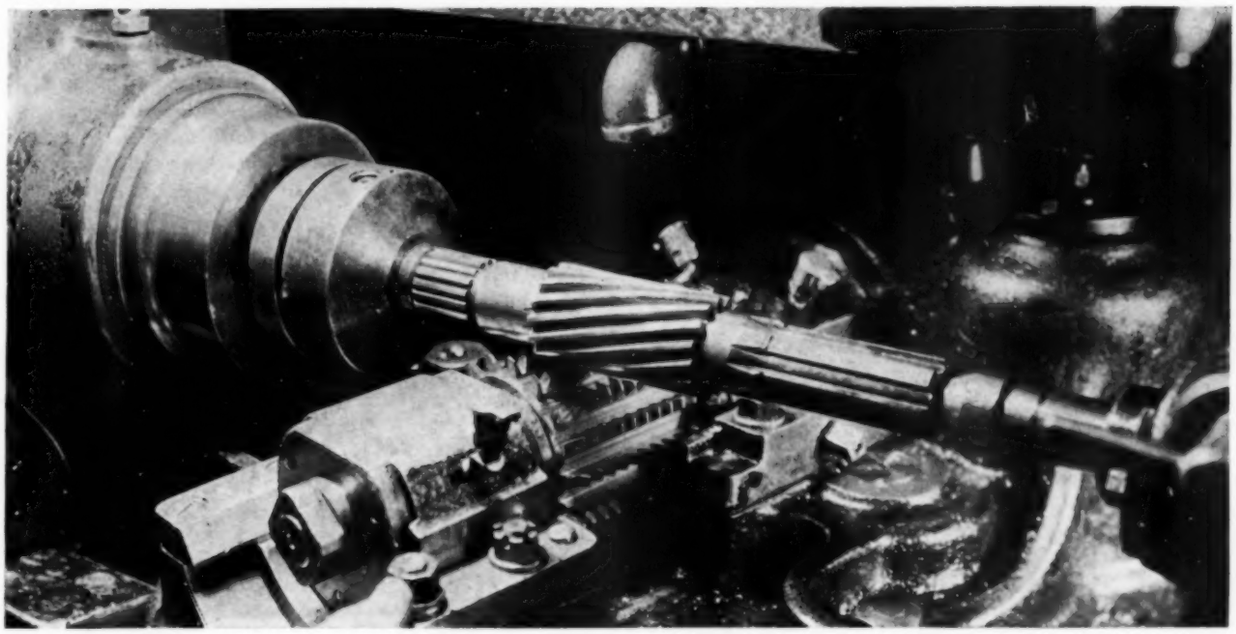
The drive shaft is lapped both on the 18-tooth spline and the helical spline, to fit their respective mating members, in a National "Red Ring" lapping machine. This equipment uses the "cross-axes" method in which the axis of the work gear arbor is set at an angle with that of the lap gear shaft with a normal variation of approximately 10 deg. On the long helical spline a special cam arrangement is used which varies the brake load to suit the work being processed.

Upon the drive shaft helical spline, the first and reverse sliding gear operates. This part, after forging and normalized, is bored, reamed and one face is chamfered in a four-spindle Gridley

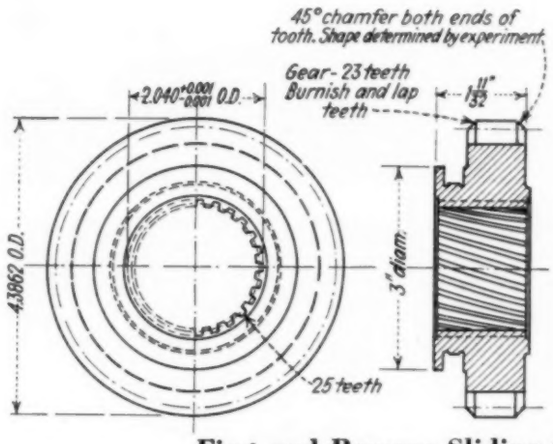


Drive Shaft

Operation	Machine
Mill to length	Davis-Thompson milling machine
Center both ends	Rockford centering machine
Rough turn and face	Fay lathe
Finish turn and face	Fay lathe
Face front end and shoulders to length	Le Blond lathe
Drill tap and center	No. 4 Warner & Swasey screw machine
Hob rear spline	Lees Bradner hobber
Hob 15-tooth spline	Lees Bradner hobber
Green grind O.D. of 15-tooth spline	Norton grinder
Green grind pilot	Norton grinder
Shape 18-tooth involute spline	Fellows gear shaper
Mill keyway	U. S. hand mill
Burr, wash and inspect	
Screw in plugs	
Harden and temper	
Polish for sclerescope and test	
Clean centers	Henry & Wright drill
Straighten	No. 4 Toledo press
Grind 0.874-0.8735 diam. pilot	Norton grinder
Grind 1.374-1.372 diam. spline	Norton grinder
Grind 1.406-1.405 bearing	Norton grinder
Grind 1.3750-1.3755 diameter	Norton grinder
Grind 1.310-1.308 diameter	Norton grinder
Grind to length	No. 2 Landis grinder
Grind end of center spline to length	
Polish one thrust and two running bearings	
Break corners, wash and inspect	



Supported by a collar at one end and an oversize center at the other, the drive shaft is machined for its helical spline on a Lees-Bradner hobber



First and Reverse Sliding Gear

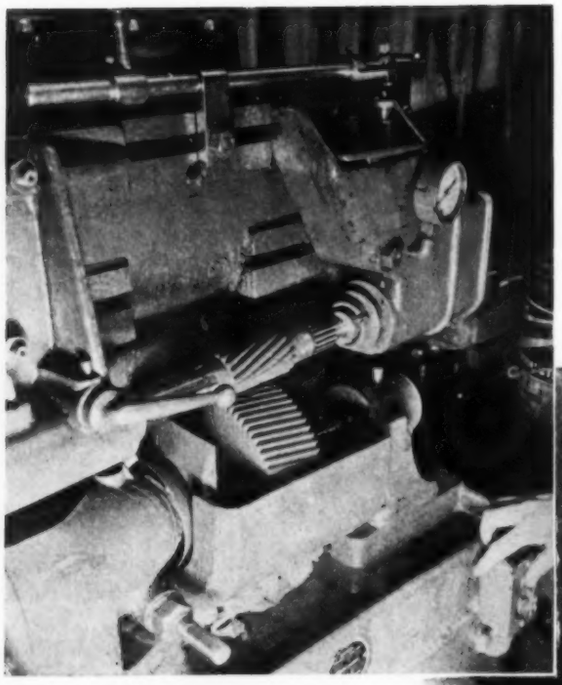
Spline cutting on the drive shaft is checked for pitch diameter by means of a ball point indicating fixture

Operation	Machine
Bore and ream, chamfer face on one side	Gridley 4-spindle chucking automatic
Chamfer opposite side	Adams lathe
Broach spline	Oilgear broaching machine
Rough turn, face and grove	Fay lathe
Finish turn face and groove	Fay lathe
Rough cut 23 teeth	Gould & Eberhardt gear hobber
Finish cut 23 teeth	Fellows gear shapers
Chamfer 23 teeth	Peerless chamfering machine
File burrs and wash	Washing machine
Burnish	Cincinnati burnishing machine
Wash and inspect	
Harden and temper	
Polish for sclerescope and test	
Draw inside spline	
Hard broach spline	Oilgear press
Grind groove	No. 1 Landis grinder
Inspect	
Lap 23 teeth	Fellows lapping machine
Speed test	National broach speeder

chucking automatic. The other side is chamfered and recessed in a second operation.

The bore is then helical spline broached in an Oilgear machine. The broaching tool itself is guided by three master lead guides and is drawn by a ball bearing puller to permit free rotation.

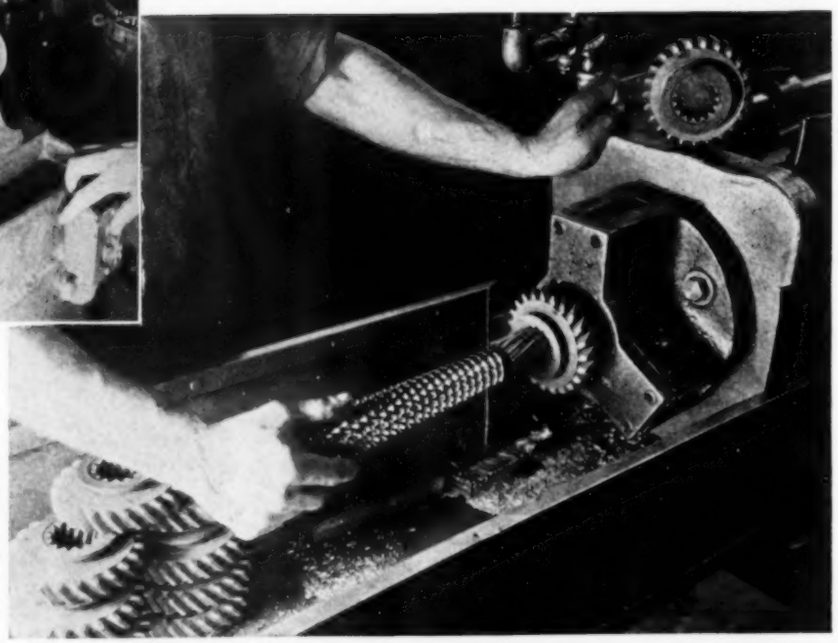
Sliding gear blanks are machined complete, two at a time, in two Fay lathe operations while mounted on involute splined arbors which fit the broached spline. A Gould and Eberhardt hobber roughs out the teeth, six



Using a cast iron master lap, the drive shaft spline is finished on a National Broach & Machine Company "Red Ring" gear lapper

Second and reverse sliding gears are finish broached after hardening on an Oilgear machine with a piloted broaching tool

Helix angles are inspected on a "Red Ring" angle checking fixture; the part shown is the low and reverse sliding gear



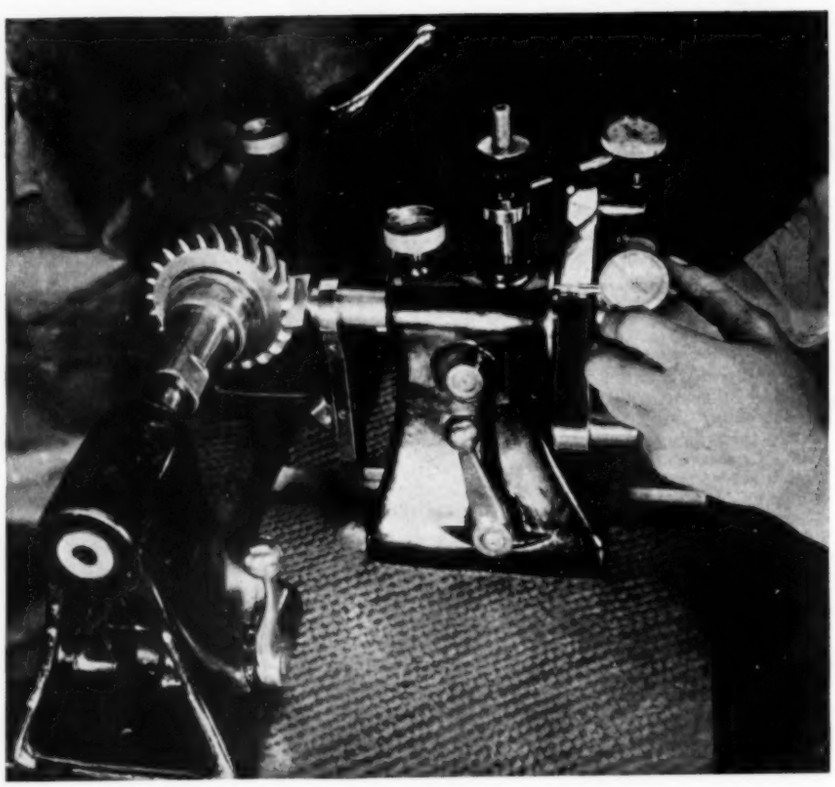
gears at a setting, with the work mounted on splined arbors. For the finishing operation that follows, each gear is supported singly on a lapped splined arbor and cut on a Fellows gear shaper.

After both sides of the teeth are chamfered in a Peerless machine, the gear is made ready for heat-treatment by filing, burnishing and inspecting. In addition to the regular salt bath draw, after quenching, a gas torch is played on the internal helical spline to give it a blue draw. This is a necessary preliminary to the next operation, hard broaching, which is conducted in much the same manner as the first broaching.

The sliding fork groove is accurately ground on the bottom and sides in a Landis machine with the work mounted on a helical involute splined arbor to fit the spline. Lapping on a Fellows lapper, inspection and the speed test, as described in Article I, complete the work on this part.

A four-spindle New Britain chucking automatic is used for the initial machining operation on the second speed gear. This includes boring, reaming, counterboring and facing one side. The shaft diameter is broached, and in order to permit an efficient drive for the heavy turning operations, a keyway is broached, first in an Oilgear machine and then in an air-actuated arbor press to remove the burrs.

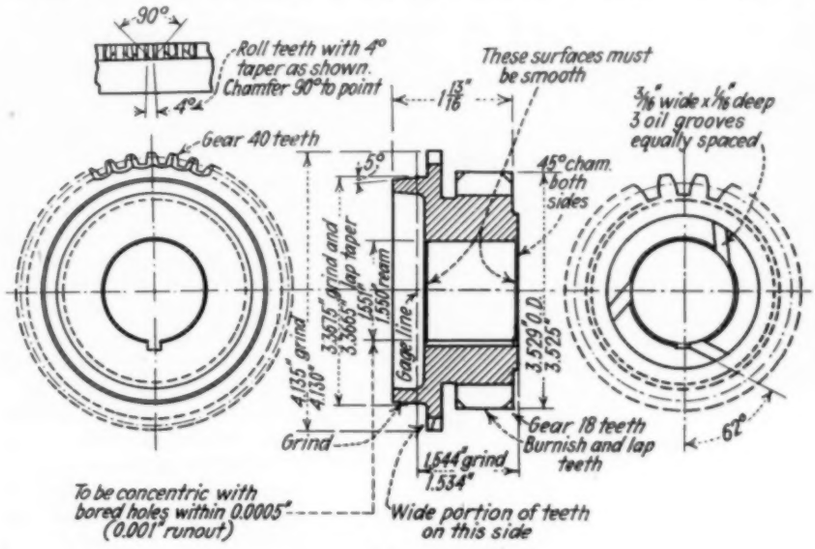
After rough and finish turning and facing in Fay lathes, the bore is chamfered at each end, and the 5-deg. diam-



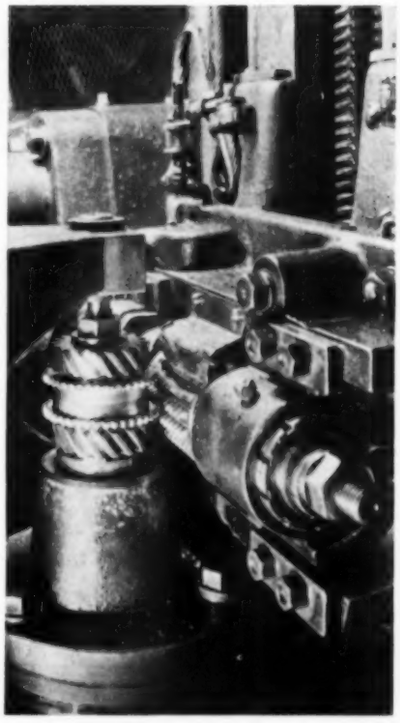
eter sized in a Warner & Swasey turret lathe. Oil grooves are milled in a Garwin hand-fed machine, using a simple three-station indexing fixture. To insure proper alignment when the gear teeth are cut, the blanks are ground square with bore on the cone end face while mounted on an arbor. The 40-tooth clutch teeth are finish cut in Gould and Eberhardt hobbers, two pieces at a time.

The helical teeth are rough cut in a Fellows machine using a three-cut cam, it being impossible to hob these teeth because of the shoulder formed by the clutch teeth diameter. The same type of machine is used to finish cut the helical teeth, using a two-cut cam and supporting the work from the hole and the ground face.

After burnishing the helical teeth, the clutch teeth are rolled with a hardened and ground master in a Milwaukee mill to give them a 4 deg. back taper. This slight angularity in the teeth flanks prevents any possibility of the outer clutch sliding out of engagement with the second speed gear when the car is driven in second speed down a hill.


90°
Roll teeth with 4° taper as shown. Chamfer 90° to point
4°
These surfaces must be smooth
1 13/16"
3/16" wide x 1/16" deep 3 oil grooves equally spaced
Gear 40 teeth
5°
45° cham. both sides
3.3675" grind and 3.3665" lap taper
1.455"
1.550" ream
Gage line
4.135" grind 4.130"
3.529" O.D. 3.525"
Grind
Gear 18 teeth Burnish and lap teeth
61°
1.544" grind 1.534"
To be concentric with bored holes within 0.0005" (0.001" runout)
Wide portion of teeth on this side

Second Speed Gear



Clutch teeth in the second speed gear are cut in a Gould & Eberhardt hobber, two pieces per set-up

Operation	Machine
Bore, ream, counterbore and face one side	New Britain 4-spindle chucking machine
Broach hole	Oilgear broaching machine
Broach keyway	Oilgear broach
Broach burrs	No. 3½ Greenard arbor press
Rough turn and face	Fay lathe
Finish turn and face	Fay lathe
Chamfer hole	No. 2 Warner & Swasey turret lathe
Mill oil grooves	Garvin hand mill
Face grind cone end	Norton grinder
Cut 40 teeth	Gould & Eberhardt hobber
Rough cut helix	Fellows gear shaper
Finish cut helix	Fellows gear shaper
Chamfer 40 teeth	Lipe chamfering machine
Wash and file burrs	
Burnish	Cincinnati burnishing machine
Roll 4 deg. back taper	No. 1½ Milwaukee mill
Wash and inspect	
Harden and temper	
Polish for sclerescope and test	
Grind one side of gear face	Heald vertical grinder
Press in bushing	Air press
Swedge broach bushing	Flexible press
Grind gear back	
Bore hole	Hendey lathe
Grind hub-clutch end	No. 1 Landis grinder
Grind hub-opposite end	Heald vertical grinder
Grind O.D. 3.369 in	Norton grinder
Grind O.D. 40-tooth gear	Norton grinder
Remove burrs	
Rough grind taper	Norton grinder
Finish grind taper	
Lap 18-tooth gear	Fellows outboard lapping machine
Wash and inspect	
Speed test	National broach speeders

The regular hardening procedure is followed. A bushing is then pressed into place with an air press and seated with a swedge broach. With the work held from the pitch diameter in a Cotta chuck, the hole is diamond bored in a Hendey lathe. Using an expanding collet in the bore to hold the piece, the clutch end hub face is ground in a Landis grinder, and the work is mounted on a vertical arbor to grind the hub to length at the opposite end from the counter bore. The outside diameter of the tapered hub and that of the 40-tooth gear are ground in successive operations in a Norton machine. This second operation puts a ⅛-in. wide straight section on the O.D. of the tapered cone.

The 5-deg. taper is rough and finished ground with the work on an arbor. This surface is held within 0.0005-in. tolerance with the bore in order to maintain correct alignment with the synchronizing cone on the clutch. Lapping, washing and inspecting complete the second speed gear.

The third and concluding part of this article will appear shortly.

Motor Selection for Turret Lathes—II

J. R. LONGSTREET
The Warner & Swasey Company

In the first part of this article the author showed a series of horsepower charts which were made the basis for correct motorization. He now explains how these charts were developed and gives some conclusions that may be derived from them

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PART I of this article showed that the following rule is applicable: *An intermittent load may be driven by a motor of a continuously rated horsepower if: (a) The motor horsepower (continuous rating) exceeds the root mean square horsepower (R.M.S.) of the load; (b) The maximum torque of the motor is sufficient to meet the maximum torque requirement of the load.*

The application of this rule to the two workpieces as shown in Figs. 1 and 2 (*AM*—Vol. 79, page 10) follows by a logical sequence of steps. With the tooling plan established as shown in the set-ups Figs. 3 and 4, time studies are made. These forms are shown in Figs. 9 to 12 inclusive. The time studies, as given, include loading and unloading of the workpiece, cutting and handling time for the machine. The total cycle is called "flat time," or floor to floor time," as differentiated from production time. The time studies used in conjunction with their respective set-ups are self explanatory. When the time studies are made, the horsepower of the various cuts is also determined by the use of the horsepower formula previously outlined. The horsepower for the individual cuts is listed on the time-study sheets under the heading, "Horsepower at Spindle Nose." Fig. 10, operation 1-A, shows 6.29 hp. for the cut. This is calculated:

$$\text{hp.} = \frac{250 \times 0.050 \times 100{,}000 \times 176}{33{,}000} = 6.29 \text{ hp.}$$

0.250 in. = depth of cut
0.050 in. = feed per revolution of spindle
100,000 in. = C_R of the cast iron
176 = surface speed, ft. per min.
33,000 = ft.-lb. per min. per hp.

It should be noted that in the calculation of horsepower for the cast iron part that surface speed rather than mean speed of cutting has been used. The depth of cut being comparatively light in proportion to work diameter, the result is influenced slightly on the side of safety. For the steel shaft mean speeds are used for horsepower calculation because the depth of cut in comparison to diameter is great. Here the use of surface speeds would cause a serious error.

Cutting Resistance of Materials

The use of the horsepower formula necessitates a knowledge of cutting resistances of various metals. For the calculations shown in Figs. 9 to 12 inclusive, the cutting resistance is taken at a higher value for finishing cuts than for roughing cuts. Broad gage tables of cutting resistance are in use, suitable for general calculations. In a particular instance of material the cutting resistance can be established by trial. For all general purposes however a material group value is sufficiently accurate.

Using the time log in conjunction with the horsepower calculations, the power diagrams are plotted as shown in Figs. 5 to 8 inclusive (*AM*—Vol. 79, page 10) using horsepower values as abscissas and time in minutes as ordinates. Calculations thus far are in terms of spindle nose demand. The final result must necessarily be modified by the efficiency factor of machine and drive.

The plotting of the horsepower demand against the time log is essential because the horsepower demand curve is a summation of the loads of the individual cuts. When the values, as shown by the graph, are used, a true result will be obtained, because these represent the sum of the individual cutter loads at a particular instant. This value square is different from the square of the power of each individual cut. If one cutter produces a load of 6 hp. and at the same time another produces a load of 8 hp., the $(\text{hp})^2$ is not $(6)^2+(8)^2=100$ but is $(6+8)^2=196$. This is extremely important to remember. Hence it is the summation curve which must be plotted.

From the plot of horsepower the $[(\text{hp})^2 \times t]$ is calculated. The calculations are tabulated at the right hand side of each chart, Figs. 5 to 8 inclusive, opposite their respective hp. values as indicated by the graph. The square root of the sum of the $\frac{[(\text{hp})^2 \times t]}{T}$, or R.M.S. at the spindle nose, is then found. This value is graphically expressed by the broken vertical line on the several charts and is shown calculated at the foot of each chart.

The value in horsepower of the R.M.S., divided by the efficiency factor of machine and drive, gives the actual horsepower requirement. This calculation, also shown at the foot of each chart, is translated in terms of the nearest larger commercial size of motor available. In the instances used in this article the combined efficiency of machine and drive has been rated as 75 per cent. Since the R.M.S. horsepower does not always govern the size of the motor, the second half of the rule must be applied, viz., the check of maximum torque demand against maximum torque of the motor.

The turning moment formula for the turret lathe is expressed

$T_M = W \times F \times C_R \times r.$

T_M = turning moment in ft.-lb.
r = radius (mean) in ft.

Other symbols have the same value as for the hp. formula.

Furthermore $\text{hp.} = \frac{W \times F \times C_R \times S}{33{,}000}$

$S = 2\pi r N$

Then $hp. = \dfrac{W \times F \times C_R \times 2\pi r N}{33{,}000}$

Converting we have $hp. =$

$$\frac{T_M \times 2\pi N}{33{,}000}$$

$$T_M = \frac{hp \times 33{,}000}{2\pi N}$$

The T_M calculations at the spindle nose are translated in terms of relative speeds in revolutions at the full load speed of the motor and divided by the efficiency factor of 75 per cent. These calculations are also carried out at the foot of the horsepower charts, Figs. 5 to 8 inclusive. The commercial size of the motor based on these calculations is represented by the right hand solid line on each of the four charts.

It is interesting to note that, in the four cases selected, the maximum torque of the motor as established by the R.M.S. hp. formula always exceeds the maximum torque demand of the load. A study of the graphs would lead to this conclusion because the periods of low power demand allow the motor to dissipate the heat generated during the peak load. The R.M.S. hp. formula being based on the measure of heat input guarantees this condition.

The second half of the law governing motor selection in the instances cited acts as a check on the type of motor selected. As an example of this take the case of the shaft set-up using high-speed steel cutters and compare it with the foot housing set-up using cemented carbide cutters. The 10 hp. motor selected for the former shows a maximum torque of 91 ft.-lb. The 15 hp. motor selected for the latter also shows a maximum torque of 91 ft.-lb. It is possible to obtain a 15-hp. motor with much greater maximum torque than 91 ft.-lb., but there is no necessity. The 15-hp. motor selected with the 91 ft.-lb. maximum torque results in a less expensive installation.

Conclusions Based on Charts

The calculations based on the charts show the turret lathe to be subject to broad variations in power demand. This variation is produced by the three factors of material, tooling set-up and material of the cutters used.

Since the turret lathe is peculiarly adaptable through tooling changes to a multitude of jobs, it is the excep-

PART OR DWG. NO. 1709
MATERIAL Cast Iron
MACHINE 3A-M-550

OP.	OPERATIONS		HP. REQD. @ SPINDLE NOSE	DIAMETER	R.P.M.	CUTTING SPEED FEET PER MIN.	FEED PER REV.	MIN. FOR IN.	LENGTH	TIME IN MIN.	TIME CHECK
	Chuck									2.00	0 2.00
I	Ro. Bore C	Depth of cut = 0.250 in. Cutting resis = 100,000 lb.	2.65	14	19	70	0.050	1.05	9¼	0.30 9.70	2.30 12.00
	Ro. Turn A		3.15	16½	19	83	0.050	1.05	7	7.35	
Ia	Ro. Turn B		3.30	17½	19	87	0.050	1.05	6	0.60 6.30	Multiple and Comb. cuts
Ib	Ro. Face F		3.48	20½	19	102	0.045	1.17	1¾	0.45 2.05	
II	Ro. Face E		2.90	17	19	85	0.045	1.17	½	0.30 0.60	12.60
III	Ro. Face D		2.73	16	19	80	0.045	1.17	1	0.30 1.20	12.90 14.10
IV	Fin. Bore C	Depth of cut = 0.030 in. Cutting resis = 150,000 lb.	0.65	14	26	95	0.050	0.77	9	0.30 6.95	14.40 21.35
	Fin. Turn A		0.75	16	26	109	0.050	0.77	7	5.40	
IVa	Fin. Turn B		0.79	17	26	116	0.050	0.77	6	0.60 4.65	
IVb	Fin. Face F		0.85	20½	26	139	0.045	0.86	1¾	0.45 1.50	21.80
V	Fin. Face E		0.71	17	26	116	0.045	0.86	½	0.30 0.45	22.10 22.55
VI	Fin. Face D		0.67	16	26	109	0.045	0.86	1	0.30 0.90	22.85 23.75
VIa	Recess G		1.66	14⅜	26	98	Hand 0.015	2.56	3/16	0.30 0.50	
	Remove									1.50	25.25
							Flat Time			25.25	
				All cutters stellite							
				or equivalent							

FIG. 9

PART OR DWG. NO. 1709
MATERIAL Cast Iron
MACHINE 3A-M 550

OP.	OPERATIONS		HP. REQD. @ SPINDLE NOSE	DIAMETER	R.P.M.	CUTTING SPEED FEET PER MIN.	FEED PER REV.	MIN. FOR IN.	LENGTH	TIME IN MIN.	TIME CHECK
	Chuck									1.15	0 1.15
I	Ro. Bore C	Depth of cut = 0.250 in. Cutting resis = 100,000 lb	5.30	14	38	140	0.050	0.53	9¼	0.30 4.90	1.45 6.35
	Ro. Turn A		6.29	16½	38	166	0.050	0.53	7	3.75	
Ia	Ro. Turn B		6.67	17½	38	176	0.050	0.53	6	0.60 3.20	
Ib	Ro. Face F		6.81	20½	38	200	0.045	0.59	1¾	0.45 1.05	6.80
II	Ro. Face E		5.80	17	38	170	0.045	0.59	½	0.30 0.30	7.10 7.40
III	Ro. Face D		5.45	16	38	160	0.045	0.59	1	0.30 0.60	7.70 8.30
IV	Fin. Bore C	Depth of cut = 0.030 in. Cutting resis = 150,000 lb.	1.16	14	70	256	0.050	0.29	9	0.30 2.65	8.60 11.25
	Fin. Turn A		1.33	16	70	294	0.050	0.29	7	2.05	
IVa	Fin. Turn B		1.42	17	70	312	0.050	0.29	6	0.60 1.75	
V	Fin. Face F		1.58	20½	70	385	0.045	0.32	1¾	0.45 0.60	11.70 12.30
Va	Recess G		2.97	14⅜	70	262	Hand 0.015	0.96	3/16	0.30 0.20	
VI	Fin. Face E		1.28	17	70	312	0.045	0.32	½	0.30 0.20	12.60 12.80
VII	Fin. Face D		1.20	16	70	294	0.045	0.32	1	0.30 0.35	13.10 13.45
	Remove									1.00	14.45
							Flat Time			14.45	
				All cutters of							
				cemented carbide							

FIG. 10

PART OR DWG. NO. 2176												
MATERIAL Sale - 1035												
MACHINE 3A-M-550			HP. REQ'D @ SPINDLE NOSE	DIAMETER	R.P.M.	*CUTTING SPEED FEET PER MIN.	FEED PER REV.	MIN. FOR IN.	LENGTH	TIME IN MIN.	TIME CHECK
OP.	OPERATIONS										
	Feed to Stock										
	Stop & Chuck									0.80	0.80
I	Start Turn A		6.14	3	83	65	0.030	0.40	3/4	0.30	1.10
II	Neck @ F to									0.35	1.45
	Diam. B		2.56	3	83	65	Hand 0.010	1.20	1/2	0.45	1.90
III a	Turn A		6.14	3	83	65	0.030	0.40	1 1/4	0.60	2.50
III	Turn B		6.14	3	83	65	0.030	0.40	1 5/8	0.45	2.95
IV	Turn C		0.98	3	83	65	0.030	0.40	1 1/16	4.50	
V	Face & Neck E		0.37	2 7/8	83	63	0.015	0.80	1/2	4.65	7.60
VI	Face & Chamfer D		1.32	2	83	43	Hand 0.008	1.44		0.45	8.05
VII	Center Drill		0.25	3/8	367	36	Hand 0.005	0.54	1/2	0.50	8.55
VIII	Cutoff & Chamfer		0.79	2	150	79	0.0083	0.81	1	0.45	9.00
			0.37	3	83	65	1/0.015	0.80	1/2	0.40	9.40
	Remove									0.30	9.70
							Flat Time			0.15	9.85
										0.45	10.30
										0.30	10.60
										0.45	11.05
										0.80	11.85
										0.10	11.95
										0.40	12.35
										0.30	12.65
										12.65	
	All cutters										
	High speed steel										
	* All cutting speeds taken from surface diam.										
	All hp. calculations based on mean cutting speeds										

Cutting resistance = 250,000 lb.

FIG. 11

PART OR DWG. NO. 2176												
MATERIAL S.A.E - 1035												
MACHINE 3A-M550			HP. REQ'D @ SPINDLE NOSE	DIAMETER	R.P.M.	*Cutting Speed FEET PER MIN.	FEED PER REV.	MIN. FOR IN.	LENGTH	TIME IN MIN.	TIME CHECK
OF	OPERATIONS										
	Feed to Stock										
	Stop & Chuck									0.80	0.80
I	Start Turn A		16.14	3	218	172	0.030	0.16	3/4	0.30	1.10
II	Neck @ F to		5.60	3	218	172	0.0083	0.56	1/2	0.15	1.25
	Diam. B									0.45	1.70
III a	Turn A		16.14	3	218	172	0.030	0.16	1 1/4	0.30	2.00
III	Turn B		16.14	3	218	172	0.030	0.16	1 5/8	0.45	2.45
IV	Turn C		2.34	3	218	172	0.030	0.16	1 1/16	1.80	4.35
V	Face & Neck E		1.00	2 7/8	218	166	0.015	0.31	1/2	1.90	
VI	Face & Chamfer D**		1.35	2	90	48	Hand 0.0083	1.34		0.45	4.80
VII	Center Drill **		0.30	3/8	532	54	Hand 0.005	0.38	1/2	0.20	5.00
VIII	Cutoff & Chamfer **		0.79	2	150	79	0.0083	0.81	1	0.45	5.45
	Remove		0.40	3	90	70	1/0.015	0.74	1/2	0.20	5.65
							Flat Time			0.45	6.10
										0.15	6.25
										0.45	6.70
										0.20	6.90
										0.45	7.35
										0.80	8.15
										0.10	8.25
										0.40	8.65
										0.30	8.95
										8.95	
	*All cutting speeds taken from surface diam.										
	All hp. calculations based on mean cutting speed										
	** These cutters high speed steel										
	All other cutters cemented carbide										

Cutting resistance = 250,000 Lb.

FIG. 12

tional case to find a turret lathe devoted continually to one job.

For purposes of motor selection, the single purpose machine is readily provided with an economic size of motor by use of the above outline. Further the size of the motor will, in general, determine the type of transmission to use between motor and machine. For instance, Fig. 5 indicates a 7½ hp. motor, and for this class of duty, a flat belt drive is entirely satisfactory.

The multi-purpose machine installation must necessarily select a motor that is a compromise. On the one hand, the turret lathe manufacturer must provide a motor of sufficient capacity to meet the demands of the average job, and on the other, he must meet the demand for electrical efficiency of operation. In the interest of meeting these two extremes it is necessary that the turret lathe manufacturer be given just as much information as is available if he is to provide an economic installation. At best so many factors can change, once the installation has been made, that only a recurrent check of loading conditions can result in the greatest power economy.

Rule for Transmission

This factor of changing conditions of operations leads to a primary rule in the application of a motor drive to a multi-purpose machine. *Apply a transmission between motor and machine drive shaft sufficient to deliver the maximum rated capacity of the turret lathe at the speed of operation.* If this is done there need be no cause for worry or delay over product design changes or increased production requirements, or changes in tooling methods resulting in a change of power demand. The vital link between motor and machine will be ample. A second consideration in the solution of the proper motor for the turret lathe follows. Select representative parts from the group to be handled by a particular installation. By representative parts is meant those that repeat the most frequently and constitute the bulk of the work on the machine. In the interest of economy it is often better to handle the small lot exceptionally heavy duty job at slower rates of feed and speed than it is to operate a machine for the most of the time with a power consumption that is but a fraction of the horsepower available. Too much stress has at times been placed on the exceptionally heavy job with a resultant general loss in the efficiency of power

operation for the average run of work.

A rapid inspection of the peak load demand using the horsepower or turning moment formulas in conjunction with the tooling set-up will help in the selection of several jobs. These jobs calculated through on the above outlined basis will establish the criterion of motor selection.

Use of Safety Devices

A third rule applies to the individual motor drive. It cannot be overemphasized. Protect the motor electrically against the recurring overload conditions that cause injury to the windings. The market affords several types of safety devices built into the motor or control that automatically throw the motor off the line when danger of overheating occurs. The operator of the machine can avoid a repetition of a shutdown by decreasing feeds or speeds to a safe level for continuous operation.

For the particular motor application, required to meet the demands of the jobs shown in this article, a series of motor sizes have been calculated in the light of single applications. Where a combination of jobs has to be considered for this particular machine the factors of recurrence, economic production rate, electrical balance, etc., must apply. Giving equal values to these factors, the machine must be equipped with the largest motor figured. This means a considerable loss in efficiency for the lighter jobs.

Another solution to the particular installation is the use of the multi-speed variable horsepower motor. For instance a two-speed motor of sufficient continuous rated horsepower and maximum torque can be installed. A motor of this character would develop 30 hp. at 1750 r.p.m. and would be available for the double-speed operation. For light duty the motor would develop 15-hp. at 875 full-load r.p.m. This motor speed change is instantly available under push-button control. The first price of this type of motor is higher than the single-speed motor, but for a given set of circumstances, may readily pay for itself in increased efficiency of operation, and increased flexibility of control.

In the particular jobs outlined it will be noted that the two cemented carbide tooling applications resort to a doubling in speed of the drive pulley of the machine. As pointed out previously this is done to meet the horsepower demand of the cemented carbide application. The doubling of speed of the drive pulley of the machine in these two instances of cemented carbide application has been done advisedly. It does not necessarily follow that this is the solution to every carbide problem. For best results obtain the recommendations of the turret lathe manufacturer relative to safe operating speeds for the particular machine to be used. Then analyze the set-up from the power angle on the basis of these recommendations.

In the solution of any problem of individual motor application to the turret lathe a common sense balancing of production requirements against power costs as a part of the total production cost must be made. The production plant using a multiplicity of individual motor applications, willing to inquire intelligently into the power demand problems of their various units, can undoubtedly utilize the method outlined to economic advantage.

A study of conditions of loading imposed on the average turret lathe installation will show the problem that confronts the turret lathe manufacturer in arriving at the proper motor to install on a machine. We believe it will also give the turret lathe user a clearer appreciation of the elements considered in applying a motor drive to this machine.

How Shall We Get Skilled Men?—Discussion

PAUL KORNAU

Business has suddenly increased in a local shop, necessitating putting on additional help. Letters were sent out to all old employees to report for work. Naturally, within the past five years when many of the shops were shut down, the skilled machinist without a job was forced to try his hand at something else. Knowing how to read drawings and to make use of his hands, he was able to find some other kind of work. He found out that he did not have to have so very much experience or knowledge to equal his earnings when working as a first-class machinist. He also found that a man delivering milk made $40 a week: had steady work the year around, received a vacation and did not need any special education.

Therefore the shop referred to was not able to get back all of its old employees and had to advertise for help. Plenty of applicants were interviewed and a lot of them were hired. These new men, although they could operate a drill press or do easy lathe work, were lost when called upon to do the more accurate jobs. The result was plenty of spoiled work and low production.

Now if one shop has difficulty in getting good help in these times, what is going to happen when business gets better and more shops need good men? Few machinists are being developed. Why should an ambitious young man learn the machinist trade when he can see that after years of work the best he can hope for is 60 cents an hour, or about ten cents an hour more than common labor is paid?

What Is the Foreman's Job?

FRANK C. HUDSON

Foreman training is a subject that comes up with fair regularity. Every manager admits the value of good foremen but there are no standard specifications as to what constitutes the desired qualities. The main reason is that managers themselves are not agreed as to the duties or qualifications. While the qualifications must of necessity vary with the size of the plant, the greatest variation is due to differences in the management and the plant organization.

Thirty years ago the strong-arm, driving type of foreman was all too common. He reflected the ideas of the management, which have, fortunately, changed in nearly all industries. Gone too, in most cases, is the demand for a foreman who will act as informer on the private lives of his men and be a buffer in all arguments as to wages and hours.

There still exist, however, varied ideas on the part of management. These range from the working foreman to that of a small shop proprietor, solely responsible for the efficient operation of his department. In between we have those who expect a foreman to be an instructor, tool designer, inspector, stock chaser, clerk and employment man. In the small shop he must often perform several of these functions.

Before we can have really satisfactory training it seems necessary to determine how many of these functions he should perform. It is the duty of management to decide what the foreman's job really is.

Furnace Brazing of Refrigerator Parts

H. M. WEBBER

Industrial Department, General Electric Company

Developments in this process make it possible to handle quantity production with few rejects and at low cost

NEW MODELS of the G.E. refrigerating machine include several unique parts which are electric-furnace brazed in a furnace of the latest design; the present application is an extension of former practice which takes advantage of the latest developments in the art. When the G.E. refrigerating machine was first introduced in 1926, it included just as many electric-furnace brazed parts as it does today. It is remarkable to note, therefore, that, during the past eight years, failure of any of the copper-brazed joints has been almost unknown.

The application of electric-furnace brazing to the manufacture of refrigerating machines is only one of many. The process is also being used extensively, because of the high strength and low cost it affords, in the large-scale production of cash-register parts, computing-machine parts, Chronolog parts, beer-barrel bungs, steel-fin condensers, automobile parts, steel tubing, steel golf-shafts and tungsten-carbide-alloy tools. Developments are also coming forward in which manufacturers propose new parts or new products to utilize electric-furnace brazing, or are making plans to convert present designs for adaptation to the process.

In electric-furnace brazing, the parts to be united are passed through an electric furnace in which a reducing atmosphere serves as a flux. There the brazing metals, applied during assembly in either solid or paste form, melt and flow into all joints by the aid of capillary attraction and become alloyed with the steel. Then, on transfer of the work to a controlled-atmosphere cooling chamber, these alloys solidify, and the parts come out of the furnace with firm, strong bonds and clean, bright surfaces. The strength of the bonds made by this process is high, and by proper design of joints with respect to area and tightness of fit, copper-brazed joints can easily be produced to have strength equal to that of the steel body.

The cost of electric-furnace brazing is in many cases lower than that of any other means of fabrication, and the elimination of servicing of brazed parts in the field is a saving not to be ignored. Rejections among electric-furnace brazed parts in manufacture are usually negligible and depend

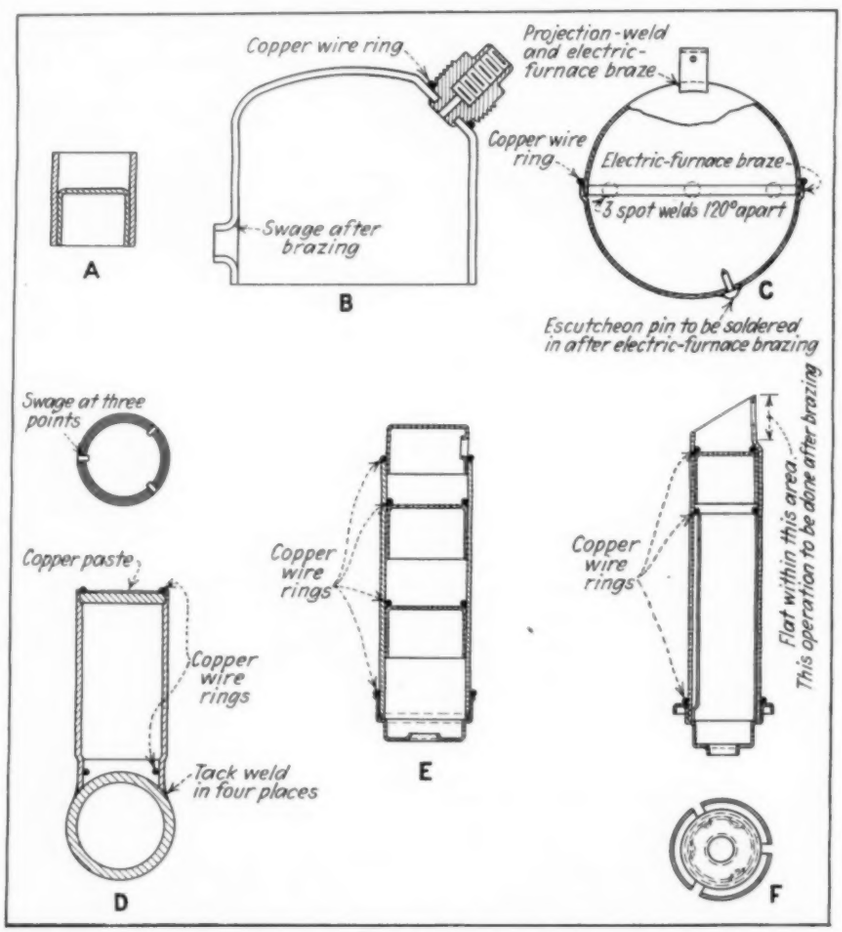

Fig. 1—*Refrigerator parts prepared for electric furnace brazing.* A short piece of steel tubing with a cup pressed into it makes up the unloader shell *A*. Before the assembly enters the brazing furnace a copper wire ring is inserted. The valve body is peened into position on the float chamber shell *B*. Two drawn shells and a strap compose the steel float *C*. The hollow piston *D* is shown assembled in cross-section. Made of a piece of tubing and four stampings the exhaust muffler *E* is brazed into one integral structure. The intake muffler *F* consists of a piece of tubing, a grooved baffle, a cap and a cup

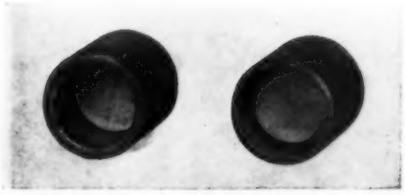

Fig. 2—After passing through the controlled atmosphere brazing furnace, where the copper melts and flows into the joint by capillary attraction, the completed unloader shell appears as shown

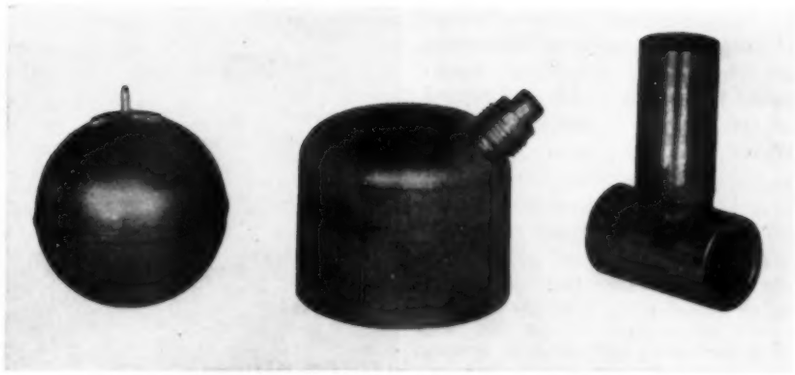

Fig. 3—From left to right are shown the refrigeration float, the float chamber and the piston after brazing

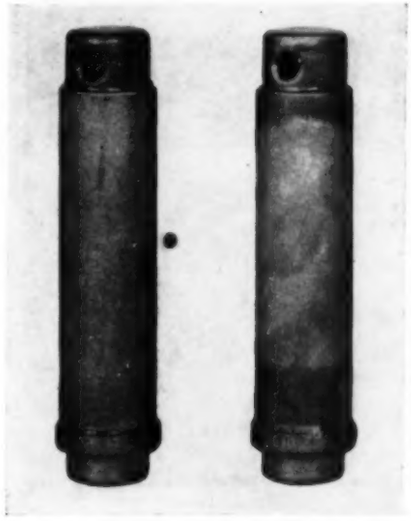

Fig. 4—The exhaust muffler with copper rings, prepared for brazing may be seen at the left and as it comes from the brazing furnace at the right

Fig. 5—Component parts of the intake muffler are shown at the left with the assembly after brazing at the right

solely upon the uniformity of assembly, because in most cases the brazing process is under complete automatic control with respect to the furnace temperature, the furnace atmosphere, and the time during which the parts are in the furnace chamber.

In the new domestic models of the G.E. refrigerating machine there are six electric-furnace brazed assemblies; the unloader shell, the float chamber, the float, the piston, the intake muffler and the exhaust muffler. Each part is of high quality, although it is made up of reasonably inexpensive and simple parts. The designs are such that the parts are formed, assembled, and prepared for brazing with comparative ease, lending themselves to both quantity and quality production at low cost.

Unloader Shell

The unloader shell, the simplest of the six brazed parts, is made of two pieces—a short length of tubing and a small cup, Figs. 1A and 2. The body consists of a short piece of cold-drawn, annealed, seamless-steel tubing, 1x0.065 in. One end is chamfered and burred in an automatic screw machine, and the part is then cut to length. The other end is burred on a bench burring wheel. The cup is blanked and drawn in one operation from 0.040-in. unannealed cold-rolled steel strip and is then burred, no trimming operation being required. Then, before assembly, both parts are given a hot-caustic wash to remove the drawing oil—this also being standard practice for all of the other parts which go into assemblies for electric-furnace brazing.

The two parts of the unloader are assembled in hydraulic presses and are then loaded in tote boxes in single layers so that the operators can place rings of 0.040-in. copper wire into position, thus completing the preparation for brazing. The assemblies are then loaded on the mesh-belt conveyor of the continuous-brazing furnace (Figs. 6 and 7) through which they travel for 60 min. from the time of loading to the instant when they drop from the belt into tote boxes at the discharge end completely brazed, with clean, bright surfaces. They are then ground to size on a centerless grinder and are ready for general assembly in the machines.

Float Chamber

The float chamber, Figs. 1*B* and 3, is made of two pieces—a stamping and a screw-machine part. The shell is blanked and drawn in one operation from 0.094-in. annealed deep-drawing steel, washed, and is then bright-annealed at 1,700 F. The same mesh-belt furnace is employed for the bright-annealing as for the brazing, and in this case the entire annealing cycle takes 54 min. from loading time to unloading time.

After the bright-anneal, the float-chamber shell is formed to size. The

next two operations flatten a corner to 45 deg. and pierce it to receive the valve body — an automatic screw-machine part. The shell is also pierced near the rim and is then trimmed to length.

Before assembly, a ring of 0.040-in. copper wire is placed over the projecting end of the valve body. The two parts are then assembled in a punch press, and the valve body is peened over to assure a tight fit for brazing.

The float chambers are now brazed in the mesh-belt-type electric furnace, the overall cycle being 67 min. After brazing, each shell is burred and the small hole near the edge is swaged. (The brazing cycle serves a double purpose—also annealing the rim of this hole.) The parts then pass on for general assembly.

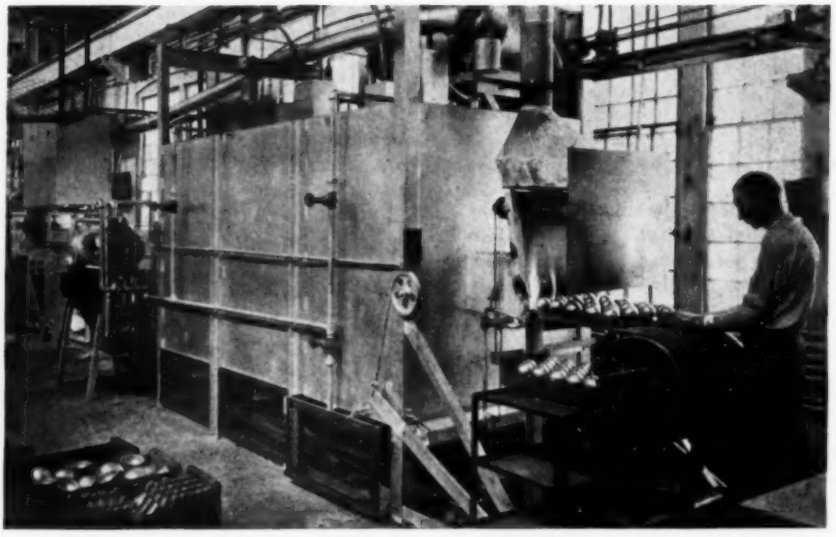

Fig. 6—Steel floats enter a controlled atmosphere mesh belt conveyor furnace to be copper brazed

The Float

The float, Figs. 1*C* and 3, is made of three parts—two shells and a strap. Both shells are drawn and trimmed in the same die in one operation. In another die, one of the shells is expanded at the rim so that it can be assembled over the rim of the other shell with a light press fit. Before assembly, a small hole is punched in one of the shells, and a small steel strap is projection-welded to the other. The two shells are then forced together in a quick-acting press.

After assembly, the shells are tack-welded together in three places, as a precaution, so that the shells will not become separated by the rapid expansion of the gas within the assemblies when they are heating up.

After tack-welding, rings of 0.032-in. copper wire are tied around the floats by operators, and a touch of copper-powder paste is applied with a brush to each end of the strap.

The floats are then ready for brazing and are set up on cylindrical heat-resisting alloy supports on the furnace belt (Fig. 6) so that they will not roll. The overall time during which the floats are in the furnace is 33 min.

After brazing, brass escutcheon pins are plugged into the small holes in the floats, which were provided to relieve expansion of the gas within the assemblies, and are soft soldered in place.

The floats are then tested for leaks by immersion in Transil oil in heavy glass cylinders which are subjected to a high vacuum. The tiniest of leaks causes a series of bubbles to rise in the oil, which can readily be observed by the operators. So uniformly tight are the copper-brazed joints that less than 0.2 per cent of the floats are rejected in this vacuum test. After being tested, the floats are ready for general assembly in the refrigeration machines.

The Piston

The hollow piston, Figs. 1*D* and 3, consists of three parts—the crosshead, the piston body, and the piston head.

The crosshead is made of cold-drawn, annealed, seamless-steel tubing, 1½x0.187 in. Pieces of the tubing are cut to length and burred in an automatic machine, and are then ground to size on the outside diameter, on a centerless grinder. The piston body is made from tubing in a similar manner. After one end of the tubing has been recessed and burred in a lathe, to receive a disk, serving as the piston head, a piece of it is cut to length, and the other end is swaged to a smaller diameter. The tubes are then set up in groups of three, 120 deg. apart, in a fixture on a high-speed lathe, and a radius is bored simultaneously on all three to fit the contour of the crosshead. The tubes are then burred.

Each piston body is then set up in a fixture, where a punch press forces into its recessed end a ½-in. thick disk (the piston head) machined for a 0.0015-in. press fit. In the same operation, the end of the piston body is swaged in at three points to lock the disk in place. After these parts are removed from the fixture, a 0.062-in. copper-wire ring is dropped into the piston body, which is then inverted on a crosshead, locked into position with a fixture, and tack welded to the crosshead at four points.

Next, the assembled pistons are loaded into tote boxes. Operators place 0.062-in. copper rings in the top recess, and fasten them in place by means of copper-powder paint, which hardens quickly and adheres both to the wire and to the steel. The pistons are now placed vertically on the furnace belt and, as they pass through the furnace, are supported by means of light-weight fixtures made of heat-resisting alloy wire. The overall brazing time in the furnace is 60 min. Upon emerging from the furnace, they are reloaded by hand into tote boxes and are transported to the same vacuum test used for the floats. Rejections among the pistons, due to leaks in the brazed joints are as few in number as those among the floats—less than 0.2 per cent. After being tested, the pistons undergo a number of grinding and machining operations previously described (*AM*—Vol. 78, page 790).

Exhaust Muffler

The exhaust muffler, Figs. 1*E* and 4, consists of five parts, all of which are brazed together in a single passage through the furnace. The outer shell —made of cold-drawn, annealed, seamless-steel tubing, 1x0.065 in.—is cut to length, chamfered, and burred in an automatic cut-off machine.

The cap at the top of the exhaust muffler, made from 0.040-in. unannealed cold-rolled steel strip, is blanked and drawn in one operation, pierced

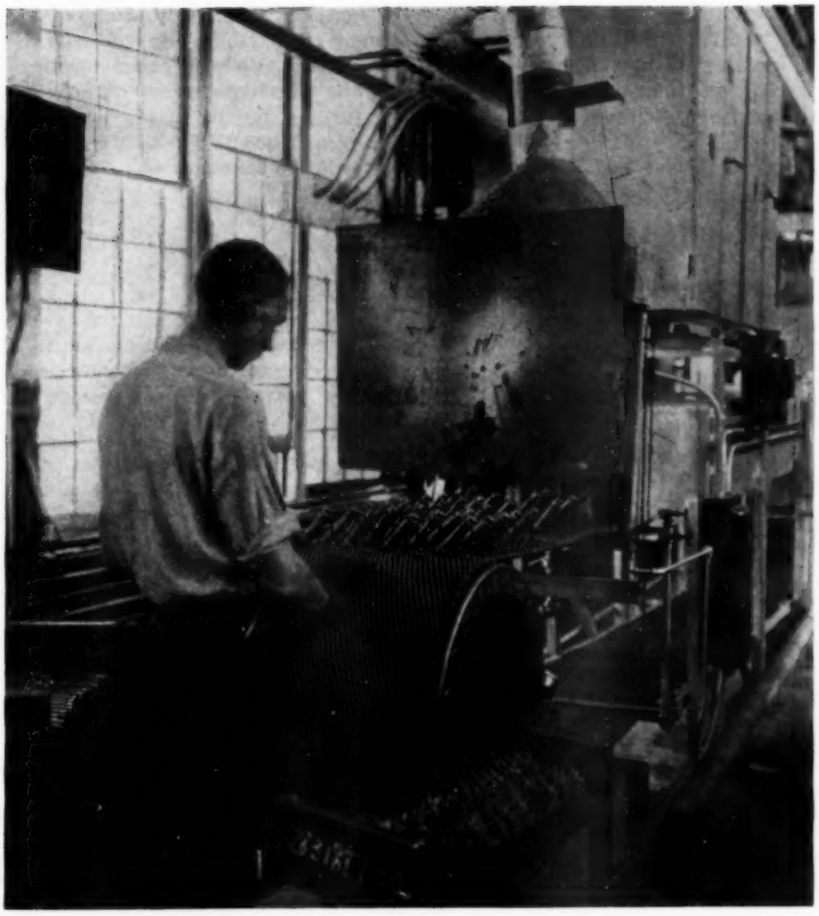

Fig. 7—Exhaust mufflers emerged bright and clean from the cooling chamber of the electric furnace, four points in each copper brazed in a single pass

and swaged in another, and then burred, no trimming operation being required. The three cups used in the muffler are made in a somewhat similar manner. All of these stampings are designed for a press fit with the outer shell.

The exhaust muffler is entirely assembled in a hydraulic press, in four operations. Three rams of different lengths, mounted on a hub, press the three cups into their respective positions. The fourth operation presses the cap over the top of the outer shell. The end cup is then spot-welded to the shell to hold it in position.

During assembly, two rings of 0.025-in. copper wire are dropped into the muffler to act as brazing metal for the two inner cups. A 0.040-in. copper ring is also placed over the shell next to the cap, and another ring of the same wire is pressed over the end cup. The preparation for brazing having been completed, the parts are now loaded on the furnace belt, and are held upright by means of wire fixtures, as illustrated in Fig. 7. The overall time in the furnace is 51 min. As the exhaust mufflers come from the cooling chamber, clean and bright, they are loaded into tote boxes ready for general assembly.

Intake Muffler

The intake muffler, Figs. 1*F* and 5, is composed of four parts—a piece of tubing, a grooved baffle, a cap, and a cup. The outer shell is made of seamless-steel tubing, sawed to 45 deg. at one end on a hand miller. Three holes 120 deg. apart are then drilled near the other end on a sensitive drill press. The grooved baffle is made of 0.020 in. annealed cold-rolled strip. It is formed in a double die, a mandrel being used in the second operation. The cup is made the same as the cups described previously, except that it is annealed after the draw and is then grooved on one side in a punch press. The cap is blanked and drawn in one operation, which is followed by notching and trimming of the edge, rolling the edge, and piercing and swaging of the center hole—four operations in all.

The baffle and outer shells are pressed together in a fixture, the cap is pressed on, and a 0.025-in. copper-wire ring is placed inside for brazing the baffle to the other shell. Then the cup is pressed into the shell and a 0.040-in. copper-wire ring is placed around the shell near the cap. After the assembled intake mufflers are loaded upright into tote boxes so that they rest on the cap as illustrated; 0.025-in. copper rings are placed in the open end at the top to act as brazing metal between the cup and the shell. The parts travel through the furnace in the same upright position, the overall brazing time being 51 min. After brazing, the shells are flattened and drilled at the open end, and then pass on for general assembly.

Mesh-Belt Conveyor Furnace

The mesh-belt conveyor-type electric furnace in which the refrigerating-machine parts are copper brazed, illustrated in Fig. 7, represents the latest development in electric-furnace-brazing equipment for light-weight parts. Furnaces of the same type are also being successfully used by several other manufacturers.

The furnace consists of a heating chamber 8 ft. long and a water-jacketed cooling chamber 24 ft. long. A belt conveyor, 20 in. wide, carries the work continuously through the two chambers, and then returns beneath the furnace to the entrance end. This conveyor is a woven-wire belt made of a nickel-chromium heat-resisting alloy. It rides on cast-alloy grid hearth plates in the heating chamber and on the floor plate of the cooling chamber. The design of the furnace affords continuous operation for brazing or bright annealing parts of low overall height, or intermittent operation for work up to 10 in. in height.

The furnace conveyor is driven from a pulley at the discharge end by a 1-hp. induction motor through a speed changer and a speed reducer. This drive permits a variation in the overall time cycle of from 28 min. to 168 min. which in terms of actual time within the heating chamber is 5.3 min. to 32 min. The furnace is equipped with heavy nickel-chromium ribbon resistors located in the roof and floor, and divided into two control zones with respect to the length. Their total rating is 88 kw., 110 volts, single phase. The furnace has ample capacity to copper-braze about 450 lb. net per hour at 2,050 F.

Atmosphere Controller

The protective atmosphere is maintained within the heating chamber and cooling chamber by means of the G.E. combustion-type furnace-atmosphere controller, which is illustrated in Fig. 8. These units reform city gas by partial combustion with air, giving an inexpensive mixture of gases suitable for brazing, which consists of about 20 per cent hydrogen, 12 per cent carbon monoxide, 3 per cent carbon dioxide, 1 per cent methane and 64 per cent nitrogen. The processed gas costs only about one-half the city gas rate, since a 2:1 volume increase takes place in the operation of the atmosphere controller for this application. The requirements of the furnace for processed gas vary with the work and with the production, but average requirements are about 800 cu.ft. per hour.

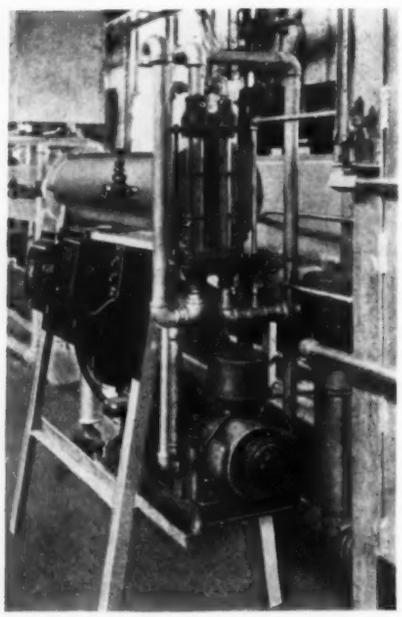

Fig. 8—A mixture of gases is supplied to the furnace by a controller which reforms a mixture of city gas and air by partial combustion

The combustion-type furnace-atmosphere controller is unusual in two respects—its air-gas input ratio is held constant, regardless of load, by means of a motor-driven air-gas mixer; its operation is entirely automatic, no attendant being required. Visual flowmeters are provided, which indicate at a glance the input ratio and volume. A surface cooler with trap partially removes the moisture from the products of combustion before they enter the furnace. The combustion chamber is lined with refractory brick, and contains a catalytic material which aids the breaking down of hydrocarbons in the city gas. This assures stability of the processed gas within the brazing furnace.

It may be said that as a result of the inexpensive methods employed in forming and fabricating these G.E. refrigerating machine parts, together with the operating economy of the electric furnace and its atmosphere controller, high quality assemblies are being made at minimum cost.

Lubrication of Machinery

M. P. HOWARD

Some time ago an article appeared in a mechanical magazine on training oilers for the care of machines, and preaching the doctrine of safe lubrication.

Any system in which there is no visible means of knowing that the lubricant flows to the bearings introduces an element of danger to the machine on which it is used. An oiler who has not been thoroughly instructed as to where every oil hole is located is a potential hazard. As a rule, workmen accept no responsibility for the machines they are operating, once their lubrication is in other hands. It would seem that lubrication of machines is the responsibility of the foreman in charge of the department. He has had a group of machines turned over to him by the management, not alone to produce work, but to care for properly.

Accounts kept of the cost of machine repairs by departments over a period of time will disclose the capability of the foreman to produce work at minimum cost, as well as to do it at the least cost to capital investment and machine upkeep. An analysis of upkeep charges will reveal some startling facts, one being that most of the repairs are caused either by faulty lubrication or by unclean lubricants. Maintenance was once a job to fix things after something has happened. Now it is to prevent troubles from happening. In China, physicians are paid to keep people well and their pay ceases when people get sick. It is a pity that some such system cannot be applied to maintenance departments in industrial plants.

While the kind of lubricant used is important, it is more important to know that it has reached the bearings free from abrasive matter of any kind. Grease as delivered to the consumer is clean and safe to use, but after the container has been opened, the chances are that the contents are exposed to dust and dirt. No wonder then that the small orifices that permit the passage of grease to the bearings are frequently clogged, or if they are clear that they permit the ready passage of dirt to the bearings.

And how about oil? It, too, was clean when delivered; but how about its handling after the container has been opened? Tanks and containers of all kinds—are they free from dirt? And the oil openings in the machines—are they ever cleaned or do they contain islands of dirt waiting to be flushed into the bearings? The chances are that oil cups, lubricators, sumps and other oiling and greasing devices have plenty of foreign matter in them. It has but one place to go and that is to the bearings.

In the last analysis, oiling devices that permit visual inspection of contents, flow and feed rates, are pretty near the top in the matter of machine safety. Sometimes they are held in bad repute because dirt has found its way from them to the bearings; also, because it was found impossible to compel oilers to keep the filling holes closed. It would seem that it is not so much a matter of training oilers as it is to take the human element out of the picture, in so far as that is possible, in the belief that it is not only a matter of what kind of oil is used as it is to be certain that it reaches the bearings in the cleanest possible condition.

It would also appear that corrective measures must consist of introducing somewhere between the original container and the machine bearings, means to prevent the passage of dirt with the oil to the bearings, and that this means must be located as close to the point of supply as is possible, which resolves itself into the use of filters—filters in the insides of oil cups and lubricators, filters in pump lines and in splash systems. As for greases, since they can not be filtered, it would appear that more strict supervision over them from the time the container is opened until the last pound is used is about the only corrective means that can be applied.

EDITORIALS

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EDITORS

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Constitutionality and Acceptance

LAST week's decision of the United States Supreme Court that one of the clauses in NIRA, the one intended to control oil production, is unconstitutional will certainly point a warning both to Congress and to the Administration. The Supreme Court is still functioning and it will continue to serve as a safeguard for the country against hasty and ill-advised legislation.

In addition to those laws that reached the statute books through established channels there is an imposing mass of so-called administrative laws and regulations issued by the President or his deputies under blanket authority granted by the last Congress. Some of these orders contradict others, a few at least are difficult of interpretation, many would not be tolerated at all except in a time of emergency. Straightening them out is going to be a terrific task, but it must be done in the interest of sound national recovery.

But besides the more or less legalistic restraints of the Supreme Court on unsound legislation, there is the even more powerful force of public sentiment to be reckoned with. In the long run no law can be enforced unless it meets with public acceptance. NIRA and the prohibition experiment are cases in point.

Public sentiment can be influenced, it is true. That is why we have politicians—and salesmen. But eventually the good sense of the average citizen can be depended upon to defeat unsound laws.

Business men and manufacturers should not be too fearful of what Congress may do. Granted that many Congressmen are unsympathetic to industry and that few of them really understand business problems, even so we have the Supreme Court and the good sense of the people to prevent their acts from doing permanent damage.

Business is built on the acceptance of hazards. Legislative restriction or interference should be looked upon as one of these hazards and not as an irretrievable calamity. There are ways of surmounting hazards; they should be discovered and applied.

IF THE WAY to oppose an unsound law is by appeal to reason and the courts, business has as ready access to the best legal talent as has any other group in the country. If, on the other hand, education of the people or of their legislators is necessary that an unwitting injustice be redressed, then resort should be had to such educational tools as the spoken and the printed word.

Business has not done such a good job in educating people to a sympathy with its problems and ideals. If it had it would not be plagued with some of its present regulative afflictions. It is not too late to start the educational job, but to do it business and industry will have to rely upon those of its leaders whose success has come through their understanding of people and their ability to gain acceptance for their views.

One Per Cent

THE 1934 edition of the *Yearbook of Railroad Information,* issued by the committee on public relations of the eastern railroads, is brim full of interesting data of various kinds. While gross revenues have declined $31,000,000, operating expenses were decreased five times this amount and net operating income is higher.

Two factors stand out for careful consideration. Nearly 33 per cent of the locomotives are in bad order and could probably be replaced with more modern types at a net saving. Over 2,900 locomotives were retired in 1933 as obsolete. Evidently a lot more should share the same fate.

Nowhere, however, do we find statistics concerning the retirement of obsolete machine-tool equipment in the railroad shops. Maintenance of locomotive and car equipment in 1933 ran up to nearly $600,000,000, which was $20,000,000 below 1932. A net saving of only one per cent of the cost for 1933 would be $6,000,000, which would buy a lot of the machine tools so badly needed in most railway shops. Many of the machines still in use were veterans when the locomotives now being discarded were new on the road. And it would be hard to find a modern machine tool that would not show a great deal more than a one per cent net saving, after making all the deductions that the most hard-boiled objector could fudge up.

. CHIPS .

Washington—Congress meets, organizes and gets to work . . . American Legion insists immediate payment of soldiers' bonus will help recovery . . . Roosevelt thinks otherwise and says so, American Veterans back him . . . Richberg is made coordinator of proposed bills originating in executive departments . . . House restores gag rule to head off unwanted legislation . . . President's first message promises early end of direct federal relief, work projects to employ 3,500,000 and wage scales below the commercial rates . . . PWA power to condemn land for community housing is denied by Louisville judge . . . Budget of $8,500,000,000 presented by Roosevelt, of which $4,000,000,000 is for relief . . . Senator Long opens promised attack on Roosevelt and advocates wealth-sharing program . . . NIRA oil control clause declared unconstitutional and Roosevelt moves to get revised legislation to meet objections . . . NRA holds hearings on price control sections in codes which are defended by manufacturers, condemned by merchants and consumers . . . Senate Foreign Relations Committee reports favorably the protocols that clear the way for U. S. membership in World Court.

Foreign—Soviets abolish bread cards and raise workers' wages . . . Premier Bennett urges Canadian New Deal . . . League covenant invoked by Abyssinia in squabble with Italy . . . Sudden secret conclave of Nazi leaders generates flock of rumors and some uneasiness . . . Outcome is establishment of Reichswehr as the only military force in Germany . . . Italy and France sign agreements that settle disputed questions and provide Italy with more territory at strategic points in Africa . . . Old German states to be wiped out and 20 new subdivisions containing three to four million people to be set up at Reichstag meeting January 30 . . . Increase in German steel production in 1934 places Reich second only to U. S. and far ahead of European countries . . . Saar plebiscite conducted in orderly fashion.

Finance—Bank losses may be deducted from income tax returns according to recent ruling . . . Federal Reserve System earned $6,000,000 in 1934 . . . Public Debt close to $28,500,000,000, a record, at end of 1934 . . . Security loans up $50,000,000 in December . . . RFC has plenty of funds, says Jones, unless Congress adds new duties . . . Gold bond clause argued before Supreme Court by Attorney General Cummings in person . . . Treasury plans for borrowing of $4,700,000,000 between now and June 30, $1,800,000,000 Fourth Liberties to be retired April 15 . . . Overtures from Gold Bloc presage effort to stabilize currencies.

Industry—New service sending wired photographs to newspapers starts . . . Saversky company gets order for 35 Army training planes . . . Big increase in sales of industrial trucks interpreted by Baker-Raulang Co. as evidence of revival in durable goods industries . . . Steel Labor Board orders elections by workers in three plants, disapproves request in fourth plant . . . Ford has added 10,000 men to payroll since Dec. 29 . . . Rise of 37 per cent in number of patent applications during last half of 1934 considered to be indicator of greater industrial activity.

Trade—New York automobile show introduces new models to enthusiastic crowds . . . Increased sales promise higher production . . . General Motors reports 1934 sales up 23 per cent.

Indicators—Steel production continues to rise reaching 45 per cent . . . Counter-seasonal increase of electric power output brings rate to 99.2 almost up to 1934 peak . . . Carloadings off somewhat . . . Business Week's index recedes a point.

Price Fixing Is Topic at First of NRA Policy Hearings

WASHINGTON—NRA opposition to all pricing arrangements except "open price" agreements and those for the natural resource industries were developed at the first of a series of hearings on NRA policies held last week. This hearing will be followed by others —employment provisions in codes is to be the subject of the next, to be held on January 30.

At the price hearing NRA presented its views then threw the meeting open to 250 who had filed for appearance. High lights were Leon Henderson's listing of the conditions necessary for effective price control: a standard product, a processing cost involved, leadership by the "bellwether" company, time and custom tending toward a standard price, cost easily ascertainable, and same tangible benefits to be obtained by price control.

Mr. Henderson torpeodoed three common fallacies, his records showing, he said, that "the industries with greatest price decline during the depression maintained employment best," that "after eighteen months of recovery, the industries with the best employment records are those whose prices are below average," and that "the industries with the smallest price advances during these eighteen months made the largest gains in employment."

Raises Pertinent Questions

Then he set down the questions that determine whether price fixing is feasible, asking that industry put itself on record: Can you create through code provisions conditions necessary for price control? Even with best conditions can price control extend for a long period? Can price control be obtained without regulation of varied other items like guarantees, discounts (37 items in all), or without production control or allocation, and (what he claims to be most important of all), without surrender by industry of its independence of decision and without greater intensity of government supervision.

Other questions posed by Mr. Henderson were: Can price control be limited to natural resources, and is not the labor reserve in the big low wage industries also a valuable "resource"? Even if price control is limited to natural resources, should it not be limited to those in which labor is the most important element of cost. Has NRA the right to allow price control to some and not to others? Does the factual and statistical background exist for doing an effective and just job of price control? How about competition and the rigidity of prices (one of the growing problems) and granting that price control is possible and feasible "why should not government, in addition to granting powers to stabilize practice in emergencies also utilize these resources to break rigidities, a power which it has in freight rates, labor rates and capital rates?"

Dr. Willard L. Thorp gave a fine background to the price structure, and Sol Rosenblatt, compliance director of NRA, set forth the three fundamental and almost unanswerable compliance difficulties concerning price provisions of the codes: minimum prices, prohibitions of sales below cost and mandatory mark-ups.

Defends Open Prices

Herman H. Lind, general manager of the National Machine Tool Builders Association, led off the public testimony with his clear explanation of open pricing and his criticism of purchasing agents who, he claims, are principally responsible in forcing price cutting. Henry S. Dennison's testimony and his defense of cost accounting, which he claims is as accurate as most scientific observations, were also highly important.

John W. O'Leary, president, Machinery and Allied Products Institute, in presenting the general case for the capital goods industries, stated that unless the NIRA accomplished something beyond fixing minimum standards of hours and wages, it will have accomplished nothing toward promoting recovery. He contended that it is in connection with pricing policies that these industries need the greatest help. Mr. O'Leary pointed out that none of the supplementary codes in the machinery industries contained any price fixing provisions, basing point systems, production control or capacity limitations. Their only effort in this direction has been in filing of open prices uniform cost accounting, prohibition of selling below cost, all of which practices he defended.

J. Harvey Williams, president, J. H. Williams & Co., and president, American Supply & Machinery Manufacturers Association, stated that the independent producer and distributor need price stabilization measures. He said that these industries of which he spoke were made up of small and medium sized concerns, no one of which dominated the industry, and no group of which held any possibility of a financially controlled monopoly. Mr. Williams noted that it is significant that despite the outcry against higher prices, no industry has been cited as having earned unreasonable profits.

S. Clay Williams, chairman of the National Industrial Recovery Board, presided at the hearing.

Saw Blade Makers Protest Price Cuts

Because certain distributors have been giving special low prices to large accounts, the supplementary code authority of the hacksaw blade manufacturing industry recently passed a resolution condemning this practice. The resolution reads as follows:

RESOLVED, that the Chairman be instructed to write to the distributors' associations and trade papers, advising that the members of this industry view with alarm the tendency on the part of distributors to give large favored accounts prices which are unprofitable and close to distributors' invoice cost; that if this practice continues there is danger that one or more members may be forced to republish on a basis which will eliminate distributors from this class of business, thereby causing similar action by others until direct selling to such accounts shall become an industry practice.

Czech Machine Pact Curtails Competition

An agreement between Skoda Works and the Ceskomoravska-Kolben-Danek will eliminate competition between the two concerns in the Czechoslovakian market, according to report by S. E. Woods, commercial attache. The production of various kinds of machinery, except autombiles, turned out by these two firms will be fixed by certain quotas which are to be based on the output and sales during the past year.

The agreement which is valid, beginning January 1, for a period of 15 years, terminates a long and protracted price war between the two firms. It is also expected that the Vitkovice Iron & Steel Works will become a party to the agreement insofar as its production of machinery is concerned.

January Auto Production May Reach Five-Year High

DETROIT — With all curtains drawn aside on 1935 cars at the New York show which opened January 5, the public is in possession of the creations staged for them by engineers in Detroit, Flint, Pontiac and other production centers. As usual, the tall stories about radical moves such as rear engine mounting, front wheel drive and many others are found to be just rumors. The changes are seen to be steps forward in the slow evolution of the automobile from the buggy stage toward a creation in which style and comfort predominate.

Even the models which were considered extreme in 1934 are continued with slight modification, but with the addition of less advanced body lines to win back customers not yet ready for the 1934 ideas. Styling perhaps best describes the gamut of the new offerings. In this connection the frank statement of General Motors that streamlining, as an economy feature, is of small importance is significant of a new trend in advertising—frankness in description of new models to the public. The Ford Company's description of its new lines from this angle has previously been mentioned.

Despite the obvious improvement in body lines this year, much remains to be done in adapting the new lines to the short wheelbase cars, especially the rear fender lines.

Product Not Cheapened

Despite the increased manufacturing costs and the failure of volume in 1934 to bring about a compensating reduction in overhead, the new cars have not been cheapened as to upholstering and other appointments.

The abandonment of knee-action suspension on some lines and the listing of it as optional equipment in others cannot be classed as a cheapening of the product, but as a move to price the cars within the range of the maximum number of buyers. The marked swing toward the lower priced brackets by makers hitherto concentrating their efforts in the medium priced field, "increasing the market coverage" is the phrase adopted by publicity people, has in many instances been accomplished by slight modification of body dies, with the addition of a new rear panel.

This re-use of dies with slight modification is capable of wide use among independents, with body-making concentrated as it is in the hands of a small number of companies. With styling assuming such great importance in the industry this move offers to independents many advantages enjoyed by the "big three."

Prices

Ford prices display a reduction of $10 for the coupe and Tudor sedan, the two models representing a third of the output this year; other models are priced upward to $30 for the phaeton at $580. Pontiac's thrift model starts at $615; Chevrolet standard models begin at $485, and the Master series at $585, with full equipment—knee action on the latter is optional at $20 extra. Prices of the Chrysler group show increases for the air-flow eight with the new air stream models priced from $370 to $500 below these prices.

Dealer stocks on all models announced are not as yet available.

With little relief in car prices suppliers are in somewhat the position of swapping dollars, with profits problematical. Generally it is true that there is little opportunity to whittle down prices on first-quarter business such is the rush to secure material. Increased competition in portions of the supply industry has reached such a point that about a 100 per cent increase in volume over that a few years ago is required to break even. Improved machinery and processes are the obvious answer, but such plans are held in abeyance pending certainty in securing business. It is reported that a several-million-dollar program of one large unit in the assembly industry has been postponed because profits per car were unsatisfactory in 1934.

Labor Troubles Discounted

The Cadillac final election of employee representatives resulted in only one affiliate of a labor organization being seated. Other unofficial strains seem to indicate that interest in organizations is waning in the face of job prospects. Significant of the new cooperation between management and workers is the Chrysler plan of opening the employment department on Sunday in the current building up of the production force, affording possibilities of more considerate handling the problem in introducing the workers to his new surroundings.

The M.E.S.A. is threatening to picket certain jobbing shops in the event of their opening for operation on Saturdays, though such limitation is not mentioned in the code.

The technique, perfected by the Automotive Labor Board in the Cadillac elections, is to be extended to other plants shortly, preliminary or primary

***Search for Smoothness*—Despite the claims for vibrationless engines which may be heard at almost any auto show booth, the search for smooth operation continues. For this purpose the Bohn laboratory uses a pencil attached to the engine which traces a graph on chart paper**

elections were held for the Detroit Chevrolet plants last week.

Interests of preparatory skilled tool and die labor will not be promoted, in the short run at least, by proposed model spacing. Rush has been the watchword on such work for the last few years; on a die which should require 100 hours on the part of one worker, because of the urgency of the order, two men will be assigned to it, taking 120 or 150 hours. A concern giving 300 men year-round work would be able, it is estimated, to keep 500 going for seven months with a high weekly hour average. Leisurely introduction of models will result in less employment for this class of labor.

January Schedule Up

Factory sales of automobiles the first eleven months of 1934 totaled 2,595,502 as compared with 1,839,492 and 1,263,325 in 1933 and 1932 respectively. November retail sales of 107,648 passenger cars are reported by R. L. Polk and Company, the largest for any November since 1929. While December figures as to sales are not at present available, production schedules for January are estimated at over 200,000, exceeded only by January, 1929.

On January 12, the automobile show opened in Detroit. During this week also the National Automobile Dealers Association will hold their annual meeting as will the Society of Automotive Engineers.

A. W. Winston Addresses Tool Engineering Group

On January 10 the American Socitey of Tool Engineers, at its monthly meeting, was addressed by A. W. Winston, chief metallurgist, the Dow Chemical Co., who spoke on the subject "Uses and Fabrication of Magnesium Alloys." The meeting followed a dinner at the Fort Shelby Hotel.

Fisher Guild Adds Class for Apprentices

To broaden the scope of the Fisher Body Craftsman's Guild, William A. Fisher, president of Fisher Body, recently announced the establishment of an apprentice class. Plans for the 1935 model coach building competition of the educational foundation, in which 856 awards, valued at more than $55,000 will be offered, include six $5,000 university scholarships.

S.A.E. Members Speak on Machining Methods

Continuing the celebration of the 30th anniversary of the Society of Automotive Engineers, which began in New York on January 7 with an anniversary dinner, the membership is holding its annual meeting this week at the Book-Cadillac Hotel, Detroit. At the annual dinner, election of the 1935 officers, headed by W. B. Stout (*AM*—Vol. 78, page 708g), was announced. Papers being presented at the production session are of especial interest to the metal-working executives.

Howard W. Dunbar, manager, grinding machine division of the Norton Co., describes the Cam-O-Matic machine which is designed especially for the finishing of camshafts. In this machine the work reciprocates while the cams are being ground; the wheel is indexed automatically from one position to the next, successively grinding each cam. If it is desirable to rough and finish in one setting all the cams are first roughed, the wheel is trued and the cams are then automatically finished in reverse order. The machine is readily adaptable to a change in design of the work.

Single-point boring of cylinders and diamond turning of pistons was described by W. F. Wise, Ex-Cell-O Aircraft and Tool Corporation. By use of the Ex-Cell-O precision boring machine, it is possible to turn two pistons elliptical and tapered with two diameter ring lands turned cylindrical in the same operation. In order to do this a follower rides on the cam that has the desired form. The production obtained from each machine is 96 per hour, with one operator running two machines, loading each alternately. The machines are hydraulically oper-

• INDUSTRIAL REVIEW •

• In most of the important machinery centers distributors report that January opened with encouraging placing of orders and active inquiry. Any comparisons of business placed during this January with that booked in the corresponding month of 1934 should take into consideration the fact that there was a small boom under way a year ago. Consequently, if the final figures for this January are up to those of last they will be looked upon as satisfactory.

• In the East both Philadelphia and Boston report some orders and distinctly improved sentiment. New York, on the other hand, has felt some slowing up and delay in closing. The labor situation in Philadelphia is causing concern. In Pittsburgh some orders have been taken, for standard as well as production tools, and inquiry is strong. Companies that have been quiescent since 1931 are inquiring again.

• General improvement is evident in Cleveland. December orders were up and January promises an equal volume. The shortage of skilled men is beginning to be embarrassing. Actual orders are being placed in Cincinnati and inquiries are numerous. Labor trouble is not imminent. Indianapolis is somewhat concerned over an undercurrent of unrest that is noticeable. Inquiries are active and orders fair.

• Deliveries on supplies in the Detroit territory have lengthened from five days to ten days or two weeks. Standard machine tools are moving and good inquiries for special equipment are up. Inquiries are also brisk in Toledo and a few orders have been booked. Sentiment is better here and also in St. Louis where business has been slow to pick up but looks decidedly promising.

• Chicago says that active orders are much improved and that the future looks bright. Labor seems to be reasonably satisfied. Sentiment is mixed in Milwaukee, some companies having orders, others none. Automotive orders have helped several plants materially. Word from San Francisco is to the effect that orders are increasing slowly and that customers are busier and more cheerful. In the Northwest orders are few but sentiment is optimistic.

ated, and the movement of the table and fixture is actuated from the main hydraulic system of the machine.

By the use of the single-point method of boring automobile cylinders, Mr. Wise states that the amount of stock to be removed in honing may be greatly reduced. The machine designed for this operation can bore eight holes in one operation within a tolerance of 0.0003 for out of round and a maximum of 0.001 for parallelism throughout its entire length. With this accuracy only 0.0005 to 0.0007 in. is left for honing as compared to from 0.002 to 0.004 in. when the cylinders are reamed.

Auto Welding Methods

P. W. Fassler, president, P. W. Fassler & Co., in discussing the application of modern resistance welding in the automobile industry, took up successively spot and flash, projection, arc, and seam welding. He contends that whereas welding equipment now available has been developed to the extent that dependable welds may be obtained, neither the automotive engineer nor the plant executive is sufficiently acquainted with the development to make full use of it. Mr. Fassler's paper was accompanied by a number of illustrative sketches showing actual welding set-ups with the type of electrodes used.

In discussing "What Is Surface Finish and How Can It Be Measured and Specified," E. J. Abbott, research physicist, University of Michigan, sums up the various methods now in use for measuring and rating finish. These include microscopic examination, profile microscopic examination, profile section method, pencil-lead method, electrical pick-up method and visual comparison with profilographed standards. Mr. Abbott pointed out the need for a series of at least three numbers to specify character of the surface as well as the size of the irregularity.

A. V. DeForrest, associate professor of mechanical engineering, Massachusetts Institute of Technology, in his address on surface integrity and dynamic strength, points out the importance of small surface irregularities on the fatigue and impact strength of materials. He describes the Magnaflux test for detecting small cracks in machine parts. Another variable factor influencing dynamic strength is the amount and distribution of the initial stress, but at present there is no general method available for attacking this problem.

Exports of Machinery During November, 1934

	November 1934	October 1934	November 1933
Electrical machinery	$6 814,603	$5,912,329	$5,552,732
Power generating machinery (except automotive and electric)	980,303	573 787	446,485
Construction and conveying machinery	416 153	544,874	308,153
Mining, well and pumping machinery	373 085	2,342,213	2,167,565
Power-driven, metal-working machinery	549,097	1,290,407	991,931
Other metal-working machinery	174,063	166,158	119,165
Textile machinery	522,969	543,907	611,479

Exports of Metal-Working Machinery During November, 1934

	November 1934	October 1934	November 1933
Engine lathes	$80,923	$56,532	$72,452
Turret lathes	37,044	47,479	56,838
Other lathes	50,588	28,651	21,876
Vertical boring mills and chucking machines	30,090	10,053	6,128
Thread cutting and automatic screw machines	32,916	83,606	41,172
Knee and column type milling machines	43,455	52,177	25,734
Other milling machines	89,183	57,084	60,892
Gear cutting machines	143,633	114,290	85,856
Vertical drilling machines	16,672	30,391	6,001
Radial drilling machines	5,130	5,895	3,708
Other drilling machines	63,625	35,825	41,062
Planers and shapers	22,685	7,400	29,419
Surface grinding machines	31,822	23,303	54,198
External cylindrical grinding machines	15,694	30,004	35,106
Internal grinding machines	64,326	41,626	30,620
Tool grinding, cutter grinding, and universal grinding machines	73,282	56,479	39,409
Other metal-grinding machines	43,959	44,364	17,206
Sheet and plate metal-working machines	151,544	139,846	41,640
Forging machinery	76,405	98,766	48,659
Rolling mill machinery	169,673	90,061	33,046
Foundry and molding equipment	67,439	32,958	31,964
Other power-driven metal-working machinery and parts	239,009	203,617	208,945

Other Metal-Working Machinery

Pneumatic portable tools	45,915	61,937	29,375
Other portable and hand or foot operated metal-working machines and parts	39,735	29,852	38,712
Chucks for machine tools	12,037	7,137	7,344
Machine operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	56,888	40,271	23,773
Other metal-working machine tools	19,488	26,961	19,961

American Tools Favored in Canadian Purchases

During the past two months a marked improvement has been noted in Canadian demands for industrial machine tools, according to a report from Consul D. C. Woods to the Department of Commerce. The improvement is most evident in the automotive and electrical industries, but iron foundries, steel mills and agricultural equipment makers have made fair purchases. Because of quicker delivery and prompter servicing the trend has favored American machine tools with favorable exchange in other factors.

Plant equipment changes for 1935 model cars have raised purchases of of machinery by automotive factories to the highest levels since 1930. Most of this business goes to the United States, notably to makers of welding and chucking machines, high speed presses, electric hoists, tool grinders lathes, boring mills and cutters. For sensitive drills, English manufacturers appear to have an advantage.

Pneumatic equipment and appliances are made by two branch plants in Canada, while another concern imports from the United States. There is considerable Canadian production of reamers, gear cutters and similar tools, while twist drills and small metal-working tools are made largely in Canada; a small quantity also comes from England.

Implement Exports Gain in November

Farm equipment exports for November, 1934, showed a gain of 72 per cent compared to November, 1933, and a decline of 5 per cent from October, 1934, according to the Department of Commerce. For the three months' periods respective totals were $1,765,875, $1,024,845 and $1,862,271.

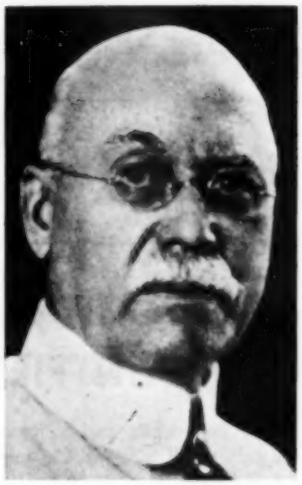
Gains made in shipments of tractors were mainly responsible for the increase, the total of this group amounting to $972,630, compared with $546,684 a year ago, an increase of 78 per cent. Foreign shipments of tractor parts in November were valued at $301,588 compared with $207,146 for the same month in 1933. The chief markets for American tractors and tractor parts were Australia, Canada, Italy, United Kingdom, New Zealand and South Africa in order of importance.

The total shipments of farm equipment for November culminated an eleven month total in 1934 of $19,887,270 compared to $10,764,309 in 1933, a gain of 84.7 per cent.

Domestic Tool Orders Reach 4-Year High

With an index of gross orders of 66.1 per cent, December topped all other months in 1934 in volume of gross orders. Domestic orders were the highest since 1930 showing an improvement of 19.5 per cent over the preceding month. Because of the unusual number of export orders in December 1933, the gross for that month was somewhat larger, with an index of 70.0.

For December, 1934, overseas business amounted to 21 per cent of the total. For the entire year, the average volume of orders is represented by an index of 46.2 which is the best showing since 1930 when the average index was 70.9. Complete tables of machine tool indexes for 1934 will appear in these pages in a later number.



JOHN J. GRANT

GEORGE M. BOND

• OBITUARIES •

John James Grant

John James Grant, known as the father of steel balls, died at his home in Plainville, Conn., on December 31, at the age of 88. He was born at Leicester, England, and came to this country with his parents in 1847.

In 1856, Mr. Grant was apprenticed to learn the trade of machinist at the shop of J. R. Brown & Sharpe, at Providence. After working as a journeyman and as a toolmaker, he started a small shop for making taps, dies and bolt cutters at Northampton, Mass. This business was the nucleus of the Wiley & Russel Co., now the Greenfield Tap & Die Co.

For nine years Mr. Grant was assistant superintendent of the Pratt & Whitney Shops, in special charge of the tap and die department. *American Machinist* was started while Mr. Grant was with P. & W., and he became one of the early contributors, his first letter appearing in the third issue, that of January, 1878. Always progressive in mechanical ideas, he wrote an article for the May issue of the same year urging the universal adoption of the then new U. S. standard threads, the use of thread and snap gages and the abandonment of such expressions as the "plump" inch. He was a frequent contributor and became close friends with both Jackson Bailey and Horace Miller, the first editor and manager of this paper. Mr. Grant was a charter member of the American Society of Mechanical Engineers, his name appearing in the first list of members in the issue of September 18, 1880.

He left Pratt & Whitney to form a partnership with John I. Bogert to build machine tools at Flushing, L. I., the firm name being Grant & Bogert. After several years the partnership was dissolved by mutual consent, and Mr. Grant was employed as mechanical engineer at the Putnam Machine Works, Fitchburg, Mass. While with that concern, he was appointed superintendent of the American Button Hole & Overseaming Sewing Machine Co., Philadelphia.

After several years' service with that company he was called by the Simonds Rolling Machine Co., Fitchburg, Mass., to perfect machines for rolling threads on bolts. While there he designed the first successful machines for making steel balls. He left the Simonds Co. to organize the Grant Anti-Friction Ball Co., at Fitchburg. Other ball plants organized by Mr. Grant at various times were the Atlas Ball Co., the Grant Ball Co., and Grant & Wood.

George Meade Bond

George Meade Bond, to whom the machine building industry owes much for his work in gages and measuring, died on January 6 at the age of 83. Born in Newburyport, Mass., he was taken to Grand Rapids, Mich., when two years old, and learned the machinist trade after leaving school. Coming East in 1876, he entered Stevens Institute of Technology. After graduation he became assistant to the late Prof. W. A. Rogers, astronomer of Harvard, and designed a comparator to aid in the investigations.

Joining the Pratt & Whitney Co., he built, with Prof. Rogers, a comparator which became the standard of measurement in the machinery field. With this as a basis he designed many types of gages now in general use, as well as the Bond standard measuring machine, well known where fine measurements are necessary. Mr. Bond was one of the early members of the American Society of Mechanical Engineers; his knowledge of fine measurements and gages was of great assistance in the early standardization work undertaken by the society.

A. J. Boyle, vice-president and general manager of the Lamson & Sessions Co., Chicago, the western subsidiary of the Lamson & Sessions Co., Cleveland, died December 24, at the age of 47.

David Rees Bowen, vice-president of the Farrel-Birmingham Co. Inc., Ansonia, Conn., and for 45 years its chief engineer, died December 29. In 1883 he entered the employ of the Farrel Foundry & Machine Co., as machinist's apprentice, but within ten years was appointed chief engineer. His ability exerted a marked influence on the design of machinery for rubber, linoleum, plastics, non-ferrous rolling mills, suger cane grinding, stone and ore crushing, paper and others.

Thomas George Cranwell, 72, organizer of the Continental Can Company and its president until 1927, died January 9.

William Watts Macon, for 23 years identified with the editorial department of *The Iron Age*, died Jan. 1. Early in 1930 he was made editor-in-chief, but severe illness required relinquishment of that position at the beginning of 1932, and he became consulting editor. Mr. Macon was a member of the American Society of Mechanical Engineers, the American Iron and Steel Institute, the American Society of Heating and Ventilating Engineers, American Management Association.

Corporation Reports

Company	1934 Earnings	1933 Earnings
Nash Motors	*d*$1,625,078	*d*$1,188,863
York Ice Machinery Corp.	*d*$815,365	*d*$840,500
Kelvinator Corp.	$1,203,439	$723,561
Williams Oil-O-Matic Heating Corp	$55,546	
Black & Decker Mfg. Co.	$325,533	*d*$683,610
Continental Motors Corp.	*d*$1,977,619	*d*$3,497,764

d—Deficit.

JOSEPH W. CUTLER, 77, one of the founders and president of the Cutler Mail Chute Co., Rochester, N. Y., died Dec. 30.

ALBA B. JOHNSTON, 76, former president of the Baldwin Locomotive Works, died Jan. 8. He became vice-president and treasurer in 1896, finally becoming president in 1911.

JOHN A. SCHULTZ, JR., 50, president of the Schultz Die Casting Co., Toledo, Ohio, died December 27.

ROBERT P. SMITH, 62, works manager of the axle division of the Eaton Manufacturing Co., Cleveland, died Jan. 6. He had spent many years in development of the products of the National Cash Register Co., the Burroughs Adding Machine Co., and the General Motors Corp.

RUFUS W. WALDORF, 46, superintendent of the body department of the Pierce-Arrow Motor Car Co., died December 25. Previous to this he was associated with the Lock & Co., custom auto body builders.

GEORGE ALLEN WILLARD, 77, for many years proprietor of the Willard Machine & Tool Co., Covington, Ky., died December 27. He was the inventor and designer of the Willard 13-in. lathe used by the Allies during the world war.

• PERSONALS •

THOMAS W. LARKIN has been re-elected president of the LeRoy Plow Co., LeRoy, N. Y. Other officers chosen are: E. L. MASON, vice-president; E. W. LARKIN, secretary; W. E. WOELLER, treasurer.

CHARLES A. MILLER, a machine designer and GEORGE P. RITTER, a toolroom lathe operator, were recently presented with gold watches by the Warner & Swasey Co., to commemorate a quarter of a century's service.

A. R. SMALL, vice-president of the Underwriters' Laboratories was elected president January 7 to succeed the late DANA PIERCE. He joined the staff of the Underwriters' Laboratories in 1906.

• EXPORT • OPPORTUNITIES

Calender for rolling and vulcanizing rubber, and small presses for making packings and washers. 8107.* Prague, Czechoslovakia.

Cotton mill equipment, including blowing, preparing, spinning, twisting, and winding machines; and special weaving looms. 8159.* Lille, France.

Engines, diesel, stationary and marine. 8150.* Manila, P. I.

Orange brushing, bathing, and drying machines; machines to close orange cases; ice-making equipment; pumping plants to be driven by electric motors or diesel engines; and stone-crushing machinery. 8157*. Jaffa, Palestine.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office.

• MEETINGS •

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Winter convention, Jan. 22-25. Engineering Societies Bldg., New York. H. H. HENLINE, national secretary, 29 West 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION. Personnel and industrial relations conference, Feb. 6-8. Hotel Schenley, Pittsburgh. Fifth packaging exposition and conference, March 5-8. Palmer House, Chicago. American Management Association, 20 Vesey St., New York, N. Y.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Annual meeting, Jan. 28-30. Buffalo, N. Y. A. V. HUTCHINSON, secretary, 51 Madison Ave., New York, N. Y.

NATIONAL ASSOCIATION OF USED MACHINERY AND EQUIPMENT DEALERS. Annual meeting and elections of officers, January 19. Meeting of the board, January 18. William Penn Hotel, Pittsburgh, Pa.

• BUSINESS ITEMS •

The Morgan Engineering Co., Alliance, Ohio, has appointed S. R. Cox, Jr., as Pittsburgh district manager with headquarters in the Oliver Bldg. Mr. Cox was formerly sales engineer for the Hyatt Roller Bearing Co., and succeeded J. J. MCQUILLEN, who has been granted a leave of absence.

The Industrial Plants Corporation (Ohio), Columbus, Ohio, will sell at auction the land and buildings, machinery and equipment of the Sidway-Topliff Company, Elkhart, Ind., manufacturer of wheel goods, on January 22, at 10 A.M.

The Herbrand Co., manufacturer of drop forge products, Fremont, Ohio, which has been in receivership for several months, has been reorganized as the Herbrand Corp., with a capital of $274,200. RICHARD S. COLE, THOMAS E. BUTLER and MILTON KNIGHT are the principals.

GRISWOLD A. PRICE has been appointed manager of sales for the St. Louis district for the Illinois Steel Co. and the Carnegie Steel Co.

• PATENTS •

January 1, 1935

Metal-Working Machinery

Die-Casting Machine. Hans Theuer, Cologne-Braunsfeld, Germany, assigned to Eckert & Ziegler G.m.b.H. Patent 1,986,544.

Shear Device. Frederick Winterkamp, Youngstown, Ohio. Patent 1,986,699.

Tools and Attachments

Machine Tool Construction. Raymond H. McClellan, Hamilton, and George Langen and Bertram B. Quillen, Cincinnati, Ohio, assigned to the Cincinnati Planer Co. Patent 1,986,006.

Holder for Wire Drawing Dies. Oscar Sjogren, Auburn, Mass. Patent 1,986,021.

Tube Flaring Tool. Henry S. Stecher, Lakewood, Ohio, assigned to the Weatherhead Co. Patent 1,986,025.

Device for Drawing Wire. Henry R. Patterson, Pittsburgh, Pa., assigned to the American Steel & Wire Co. Patent 1,986,777.

January 8, 1935

Metal-Working Machinery

Machine for Cutting or Grinding Helical Gears. Adolph L. De Leeuw, Plainfield, N. J. Patent 1,896,797.

Bending Machine. Arthur J. Mason, West Hartford, and William L. Tancred, Hartford, Conn., assigned to the Bush Manufacturing Co. Patent 1,987,021.

Sheet Metal Drawing Machine. Edward H. Fabrice, Chicago, Ill., assigned to Fabart Instrument Co. Patent 1,987,101.

Tools and Attachments

Feeding Attachment for Punch Presses. William W. Sime, Oak Park, Ill. Patent 1,986,983.

Tool Head. Constant Bouillon, Torrington, Conn., assigned to the Hendey Machine Co. Patent 1,986,997.

Tool Coupling for Sheet Metal Work. Latimer L. Charnicky, Towson, Md., assigned to the Black & Decker Mfg. Co. Patent 1,987,465.

American Machinist

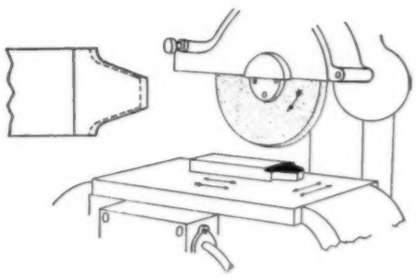
REFERENCE BOOK SHEET

Grinding Cemented-Carbide Tools

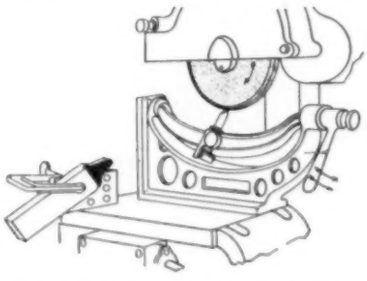
Form Tools

Courtesy of The Carborundum Company

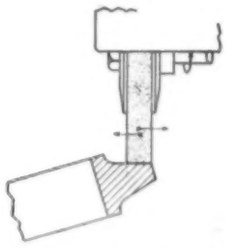
Straight-Shank Form Tools



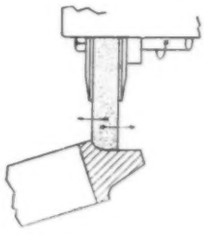
A. Set up tool on magnetic chuck or in a vise and surface grind the top.



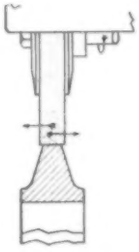
1. Set up of tool and dressing attachment.



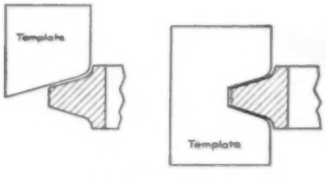
2. True the wheel square, set up tool in a vise and grind the sides, passing the wheel across the work.



3. True the wheel to correct shape, and grind the radius.



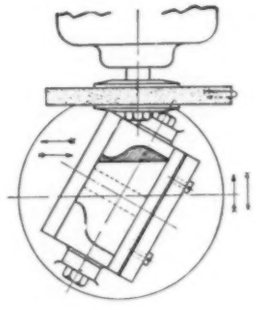
4. True the wheel square and grind the nose.



5. Using template.

NOTE: The work involved in securing the desired shape consists of alternate dressing and grinding until the correct shape is produced. Usually only a few passes can be taken with the wheel before it requires redressing. The use of sectional templates is advocated during the course of the grinding as a rough check on the work, but the projectograph should be used for the final inspection.

Circular Form Tools



1. Set up tool in vise so that correct angle will be produced.

2. Grind, passing the work under the wheel and feeding down the wheel slowly.

Straight-shank form tools made with the nose the same size and shape at top and bottom as indicated at *A* may be sharpened by surface grinding only, since reducing the tool thickness does not change the form.

Tools made with side clearance must be ground on the nose to sharpen them, since every reduction in tool thickness causes a change in form. Form tools with side clearance that are used on work not held to close limits may be surface ground.

Where the nose must be ground, the wheel is trued to the required shape every few passes to compensate for wheel wear and the tool ground a section at a time as shown in Figs. 1 to 5. The work should be checked frequently with templets and a final inspection made with a projectograph.

The grinding of curved surfaces is especially time-consuming because of the frequent dressings necessary. Usually a magnifying glass held over the point of contact between the wheel and the work will enable the operator to do better grinding and enable him to true the wheel with more accuracy. General instructions: (1) The wheel must be dressed frequently to maintain shape; (2) use light feed and examine the work frequently.

Circular form tools, like dovetail form tools, are resharpened by grinding on the top of the tooth and not disturbing the form ground on the periphery of the tool by the manufacturer. A surface grinder or tool grinder mounting a plain wheel is recommended. Cup wheels are not recommended because of their slow

American Machinist
REFERENCE BOOK SHEET ©

Grinding Cemented-Carbide Tools

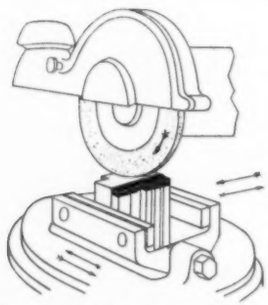
Form Tools and Saws

Courtesy of The Carborundum Company

cutting action and tendency to generate heat. Where the angle between the tip and body of the tool is 90 deg. or more, a straight-faced wheel may be used. Where the angle is less than 90 deg. the wheel face must be trued at an angle, enabling the grinding to be done entirely across the carbide tip. Lapping is recommended. General instructions: (1) Use light feeds; (2) pass the work across and back and forth under the wheel.

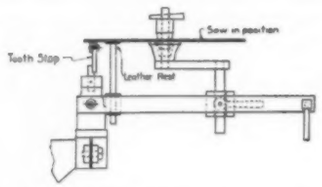
Dovetail form tools such as illustrated will require regrinding only on the end. Offhand grinding is not recommended because of the large area of the carbide involved and the danger of cracking the tip of an expensive tool. Surface grinding on the periphery of a wheel, either on a surface grinder or a tool and cutter grinder mounting a plain wheel, is satisfactory. The direction of rotation of the wheel should be against the cutting as far as possible. The cross feed and table traverse may be machine- or hand-driven, depending upon the machine. If the center of the ground surface is high take more passes at the lower wheel in-feeds. Lapping is recommended. General instructions:

Dovetail Form Tools

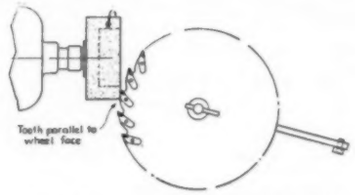


1. Set up tool in vise so that correct angle will be produced on the work.
2. Grind—
   Down Feed .001-.002 per pass for roughing; .00025-.0005 per pass for finishing.
   Cross Feed—$\frac{1}{16}$″
   Table Traverse—30-35′ per minute.

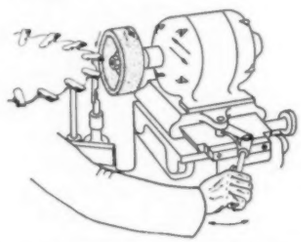
Saws



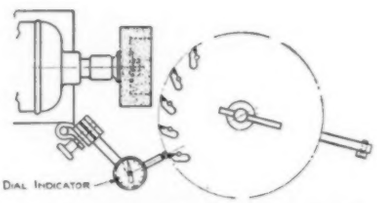
1. Mount saw on arbor (cone and wedge) held rigidly but free to rotate.



2. Swing arm until top of tooth which has its face against the tooth stop is parallel with wheel face.



3. Feed wheel to tooth and oscillate across tooth. Do not allow wheel to clear tooth at any time or it will be damaged on return stroke.



4. Back-off wheel, measure tooth with dial indicator.
5. Repeat 2, 3, 4 for rest of teeth.

(1) Feed wheel down when starting pass and again when returning across tool; (2) cross feed may be in both directions of the table traverse but preferably only in one; (3) cross feed and table traverse should be at a high rate.

Note: Harder wheels will require less down feed. Shop conditions or the operator's skill may necessitate lower wheel feeds. The cross feed will depend upon the size of the tool, but in general it is good practice to use high cross feeds rather than low ones.

Cemented - carbide - tipped saws are made in two general types—solid-tooth and insert-tooth. Solid-tooth saws are supplied with two tooth styles, straight-front and alternate-bevel, while insert-tooth saws include straight-front, alternate-bevel, and square and advanced type of teeth.

The sharpening of carbide-tipped saws is essentially the same for the different classes and types. The outer edge only is ground, without touching the front face of the tooth. Special machines have been developed for saw grinding which mount either a cup wheel or a lapping disk. Where the front of the teeth must be ground, a saucer-shaped wheel may be required, depending upon the number of teeth in the saw and the spacing between teeth.

Where less than 0.002–0.003 stock must be removed, the saw may be sharpened by lapping only. In any case the saw should be lapped after grinding. Care must be taken in grinding and in lapping to finish all the teeth to the same height, using a dial indicator for measuring. While allowance must be made for wheel wear in grinding, there is no wear on the lapping disk.

The steps in sharpening a typical saw by grinding are given. For lapping the procedure is the same, since the lapping disk is mounted in place of the grinding wheel. General instructions: (1) Stock to be removed should not exceed 0.002 – 0.003; (2) grind against the cutting edge; (3) use light feeds.

Old Age Retirement Plans Federal vs. Industrial

G. CHAUNCEY PARSONS

In Vol. 78, page 567, the author called attention to the necessity for a study of various pension plans. Now at the start of a new Congress he outlines several possible alternatives, briefly pointing out the advantages and disadvantages of each

WHAT CAN American industry expect in old age industrial pensions from the Administration? Are we going to have a law, making old age pensions for industry mandatory? If so, what form will it take?

There are some general forms that could be followed:

1. A blanket federal law, covering industry in all its branches, operated by a government bureau and all the funds put in one national pool.

Such a plan might fit some of our industries but, obviously, it could not do a real job for all of them, taking into consideration type of work, geographic location, the great variety of living costs due to the size of the country, and type of employer. It could easily become a political football, operated and manned by the party in power without competition and perhaps not even under civil service requirements.

As to costs—just what would they be? Could the government guarantee a rate of interest on the funds collected for pension purposes so that the rates could be calculated on a sound actuarial basis?

What type of investment would be used? Government obligations only? Safe—yes. But at what interest rate?

We must remember that a pension is an annuity for the individual and the foundation of an annuity is composed of two factors: compound interest and mortality. To this, from a cost point of view, must be added the expense of doing business.

State Plan

2. Instigated perhaps by the threat of federal legislation but operated by the states, we would have, first 48 varieties; second, a blanket plan covering all industry in that state without regard to the needs of the different industries. Again political control—maybe 48 varieties again of bureaus, under control of the political party in power, or civil service.

What would happen to the pension plans of large corporations with branches in many states? Would they have separate plans for each state? How about the transfer of men from one branch to another? And such a plan would still be subject to the same objections as a federal plan for all industry.

Plan for Each Industry

3. Would the machinery industry, and allied businesses, desire a general blanket plan to cover the country without consideration of geographic location and conditions allied thereto? These would perhaps be operated by the present code authorities or by the national associations, paying funds to a central bureau in Washington under somewhat the same conditions outlined in Plan 1.

A Federal Law

4. Setting up the minimum requirements of pension and maximum retirement age, but allowing each corporation, company, firm, individual employer to design his plan to fit his particular needs and geographic location would be the purpose of such legislation. It would give him the option of carrying that plan with duly licensed insurance companies of his own choosing, or placing it with a federal bureau as he might see fit.

We would then have the benefit of private enterprise (under strict supervision, however) with all its advantages such as competition and initiative and something really made to fit our needs and not just a blanket form. Private enterprise is the very foundation to which this country owes its growth and our life insurance companies have not failed us even in times of greatest stress.

A certificate of compliance with the terms of the law from the insurance company, concurred in by the employer, could be forwarded to a pension bureau maintained by the government at regular intervals. This would protect the worker. Should there be no compliance, necessary steps should be taken to enforce it.

Further, the licensing of pension agencies would protect industry from the unauthorized and unscrupulous. Provision should be made for raising the minimum from time to time if we desire real social progress.

Remember, our pensioners, properly pensioned, represent a potential market for our products, and we need those markets. Should industrial units prefer to insure through the government bureau, it should be their privilege to do so.

Needles for Scriber Points

CHARLES WESLOW

In my opinion the best kind of scriber for tool and die makers is an ordinary sewing needle held in a pin chuck having a knurled handle. I have two of these pin chucks, one for large and the other for small needles. I also use a large darning needle for scribing punch blanks through die openings or for scribing die blanks from the finished punches. The needles are hard enough to scribe fine lines on tool steel.

While the needles can be sharpened by chucking them in the bench lathe and revolving them at high speed, they are so cheap that they can be thrown away when too dull for use.

An Accurate Index Plate

A. L. DE LEEUW
Consulting Engineer

The author clears up some common fallacies about accumulated error and shows a practical set-up for precise indexing

GENERATING an accurate index plate has always been something of a problem. This article describes a method followed by the anthor with good success—if the truth must be told, with better success than expected.

Before describing this method I wish to call attention to misunderstandings on the subject which have come to my attention on several occasions.

When an index plate has been generated, it is inspected as to accuracy. If an indicator is used, readings are taken of the various stations, and I have found that these readings are considered as indicating the amounts of error between adjoining stations, or rather, that the readings themselves are supposed to show the error in position of each of these stations.

That this is not so is shown in the following analysis of indicator readings on an imaginary index plate. There are supposed to be twelve stations. The figures given may be assumed to be thousandths of an inch or tenths of thousandths, according to the reader's preference:

0 +2 +3 −1 +2 −3
−2 +4 +2 +2 −1 +4

It is then taken for granted that the greatest deviation from the true position is three on the negative and four on the positive side, and the statement is made, with a perfect desire to tell the truth, that the plate is accurate to within four units (thousandths or tenths).

The correct procedure would be the following:

Add all the figures obtained by the test, and divide this amount by the number of stations (twelve, in this case). The number so obtained is the ideal number, that is, it would be the indicator reading for all of the stations if, by some trick of magic, it were possible to make the plate perfect.

The first distance indicated is not zero but some amount which may be called A. The second distance is $A + 2$. The next one is $A + 3$ and the sum of all the distances is $A + 12$, so that the ideal distance is $A + 1$. As the first indicator reading is zero, it follows that the first distance is 1 short. Similarly we find that the second distance is 1 long, and so on. The corrected table of distances becomes

−1 +1 +2 −2 +1 −4
−3 +3 +1 +1 −2 +3

Even this list of readings does not show the degree of accuracy of the index plate. As the list stands, it would seem that the greatest variation between two divisions is seven units, and this is true if one is interested in single divisions only. However, an index plate may be used in different ways. One may divide into twelve with the plate assumed here, or into six, or four, or three, or two. Furthermore, one may wish to space five or seven, or any other number of divisions at a time, and then the error becomes whatever happens to be the greatest accumulation of individual errors.

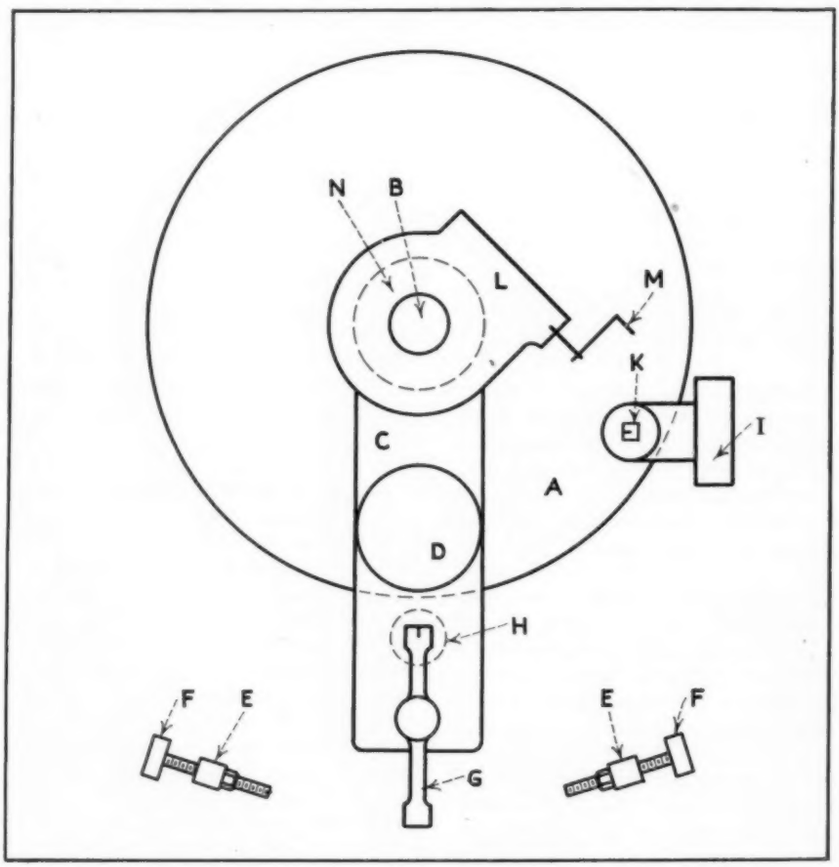
If the plate is used in steps of two divisions, the maximum accumulated error may be found as follows:

0 +3 0 −1 −3 −7
0 +4 +2 −1 +1 +2

If three divisions are used, the errors will be:

+2 +1 +1 −5 −6 −4
+1 +5 0 +2 0 +3

In the first case the greatest plus error was four and the greatest minus error seven, so that there is an accumulated error of eleven. Similarly, one



Remarkable accuracy was obtained by using this device for indexing

finds an accumulation of eleven in the second case. It is not necessary to show in detail what would happen if four or more divisions at a time were taken.

With four divisions the accumulated error would be 13 units.

With five divisions the accumulated error would be 12 units.

With six divisions the accumulated error would be 10 units.

With seven divisions the accumulated error would be 12 units.

The foregoing shows clearly how wrong it is to take the indicator readings at their face value. It also shows that the final accuracy depends on the greatest possible accumulated error and not on the individual errors. And, finally, it shows that the proper way to generate an index plate is to accumulate the individual errors and then work toward a reduction of that accumulation.

Spacing With Dividers

This is exactly what the old-time mechanic used to do, and perhaps still does, when he steps off his spaces with his dividers. When he has come to the end of the spacing he finds that he is a certain amount short or perhaps too long, and he increases or reduces the individual steps. Although this method is entirely correct in theory, it does not lend itself to extreme accuracy, the kind of accuracy which is expressed in tenths of thousandths and not in sixty-fourths. Among the reasons why this method can never be very accurate are the following:

Though the points of the dividers are supposed to be sharp, they are actually round. Though the marks made by these divider points may be very light, yet they are, so to speak, deep grooves; and when the correction in the individual spacing is so small that it is less than the width of one of these grooves, the divider legs will fall into the groove even after the correction has been made.

However, this method of stepping off was used by the author with this difference — that he did not use the dividers.

A large turret had to be indexed. This had been done roughly by milling the slots and inserting hardened steel pieces to receive the slot bolt, but the final accurate indexing still had to be done. The accompanying figure shows the apparatus used for this purpose.

The turret *A* was placed on a heavy platen and centered on the stud *B*. On this same stud was centered the arm *C*, which could swing between two set-screws *F*, held and locked in posts *E*. On this arm there was pivoted a lever *G*, one end of which would strike the set-screws and the other end of which carried a silver plate with a very fine line drawn on it. A microscope *H* could be adjusted over this fine line.

This microscope had a narrow slit instead of hair lines, and this slit could be moved by a micrometer adjustment.

Rotating the Turret

The set-screws *F* were adjusted so as to make the distance between them roughly one of the desired divisions. When the arm *C* was swung to the left, the lever *G* would strike a set-screw and the movement of the arm was continued until the fine lines came under the slit of the microscope. The arm was then moved to the right until again the slit was in the field of the microscope. This movement was accomplished by means of a worm and wormwheel and hand crank.

When the arm was moved to the left, it took along the turret by means of an electro-magnet *D*, but when it was moved to the right it did not take the turret along because the current had been turned off.

If the turret were to be divided into twelve spaces, twelve back and forward movements of the arm were required. In order to find out whether these twelve movements actually made a complete circle, a little silver plate with a fine line was placed somewhere on the turret and the microscope *I* was placed on the platen so that its slit came over the fine lines *K* before the operations were started.

If the twelve divisions actually made a full cycle, then the line *K* should be again under the slits of the microscope when the twelve steps were made. If it were not, then the amount of error—in the beginning very large—could be estimated and the set-screws *F* could be adjusted for a larger or smaller swing.

A Three-Day Job

The microscopes were so adjusted that a movement amounting to a 0.00002 in. would bring the fine line in or out of the slot. Two men readily agreed as to this 0.00002. One man could duplicate himself to 0.00001 in. Therefore, if one finally succeeded in getting the line *K* once more in the field of the microscope, the accumulative error would not be more than 0.00002 in. One naturally would suspect, and the author did suspect, that it would take considerable time before such a result could be obtained. It might take weeks, perhaps months, of careful work to come to that degree of accuracy. As a matter of fact, this point was reached inside of three days.

Though the accumulative error was small, this did not prove that there may not have been two individual errors much larger than the accumulative one, but which had canceled each other.

After one complete cycle had been made with this infinitesimal accumulated error, the operator went around once more, without making any adjustment, and again got the fine line in the field of the microscope, thus showing that the accumulative error of two cycles of operation was less than 0.00002 in. The same operation was repeated once more. By this method the probability that individual errors had canceled each other, while the final accumulative error would be the same three times in succession, had become so slight that it was felt it would no longer need to be considered.

The Final Touch

After the work had progressed that far, the hardened steel inserts were ground by a small grinding head mounted on a slide which could be adjusted around stud *B* as center. Each insert was ground in its turn until all of them were no longer touched by the grinding wheel. The blocks were then rubbed in with red lead, and one more finish cut was taken, but so light that some, but not all, of the red lead was removed. All this required three or more complete cycles. This made a total of six cycles, and at the end of these six the fine line *K* was again under the microscope.

The writer thought at that time that such complete success could be obtained only once, and that one should not expect to duplicate it. However, there was occasion to index another plate by the same method. This time it was not necessary to do any grinding, but again it was found that after a couple of days' work, the line *K* appeared under the microscope and in the original position after three complete cycles.

This would indicate that the method of indexing described has general application and can be applied without running into prohibitive cost or delay. At any rate, it has worked well for me.

Tool and Die Design for Safety

GEORGE KOCH

Chief Tool Designer, Murray Body Corporation

APPRECIATION of the progress made in safe die designing during a short period of time may be obtained by considering a die drawing of only ten years ago. At that time, a die drawing was merely a matter of designing a die that would produce a given part, and if that die fulfilled its purpose, it was considered quite an achievement. Lost fingers and crushed hands were practically accepted as the inevitable outcome of every production run, and no special effort was made to analyze the origin of these accidents.

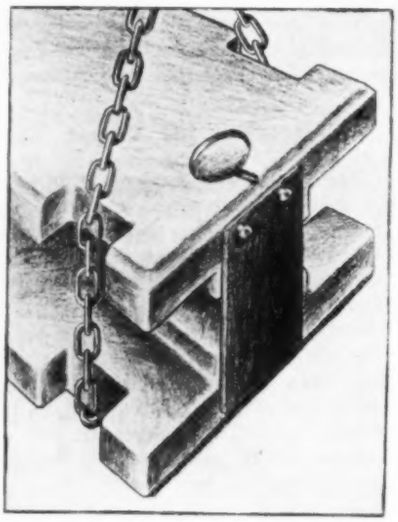
Safety was an unfamiliar term in the drafting room until it was realized that the enormous yearly accident cost could be greatly reduced by stimulating safety-consciousness in the designing department. It was remarkable to find the safety benefits that could be derived at small cost if made part of the design.

Today a well designed die must incorporate safety results as well as good mechanical principles. If we fail to educate the designer that his responsibility includes humanitarian considerations as well as technical elements, all our instructions to press operators regarding safety will be futile.

Chain Slots

With the present system of conveying dies over the heads of press operators in the pressroom, there must be a way of handling the equipment so there will not be the slightest possibility of a die slipping through a chain. At the Murray Body Corporation, a 2x4-in. chain slot is put in each corner of all dies large enough to carry them. By the use of these slots the die is always boxed in on three sides. Some authorities believe a ledge is sufficient, but we have found, through experience, that our method is far more effective as an accident reducer. For example, if one chain should break, the die will be retained in the air until lowered in safety.

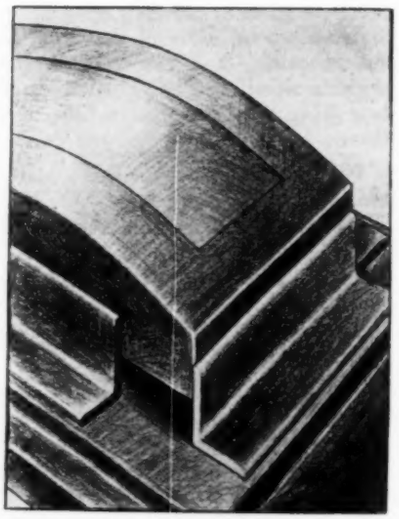
In addition to this safety feature, these chain slots offer an economical measure, inasmuch as the rounded corners do not tend to crack or fracture a chain or rope, thereby increasing the life of the handling equipment.



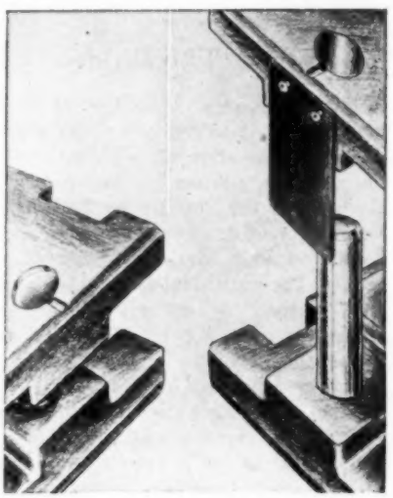
Large chain slots at each end of the die prevent slippage when handling on a crane

Many a finger has been crushed when an operator riding a pad did not realize until too late that the pad bottomed or closed up. All of our pads are inclosed with sheet metal or iron guards. These guards not only prevent crushed fingers, but also prevent dirt and sediment from entering between the pad and shoe, thus avoiding breakage of the die.

Guarding of guide pins has always been a problem open for suggestion. If a die were to run in one particular press, the problem would be comparatively simple, but since most dies must be made flexible enough to run in all types of press with strokes varying from 6 to 16 in., a much more serious problem confronts us. At present, we have adopted a method that is actually a modification of the guards used on railroads for a signal to brakemen at the entrance to a low bridge. These leather guards are attached to the upper pin boss, and extend down far enough to warn an operator with a sharp blow in case he has his hand between the guide pin and the bushing.



Inclosed pads avoid crushing fingers of operators who forget that the die gap is not the only source of danger



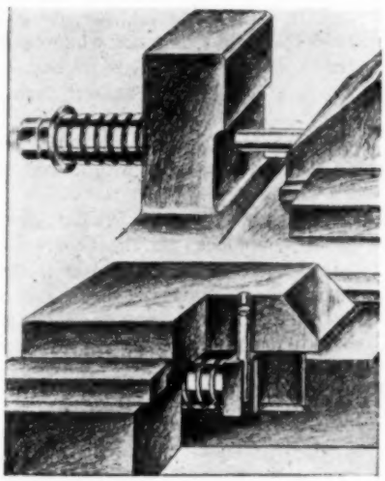
Guide pins are covered with a leather strip that serves as a warning, and pin bosses are designed with ample clearance

We also maintain a minimum clearance of 2½ in. between the upper and lower guide pin bosses, and wherever possible between the male and female die. Not many years ago, we ignored this particular feature of clearance on all surfaces, but we now insist on it. In some cases, however, such as the binder ring of a draw die, this is impossible as the die must close to grip the metal.

The accompanying sketch shows two applications of spring returns for cam slides. The upper one shows a method commonly used a few years ago. This consists of a compression spring acting through a rod which is fastened to the cam slide block. A washer and jam

From an address presented before the Detroit division of the National Safety Council.

nut are used to retain the spring. If anything should happen to the spring or slide, or if the jam nut should work loose, the spring would be released with a tremendous force. Sometimes the safety hazard created by this method may be reduced by applying sheet metal or pipe covers over the jam nuts and springs.



Above may be seen the exposed return spring for cam slides and below the concealed design which makes for greater safety

The lower method shows the spring set in milled pockets in the lower shoe. This method is more costly in the building of the die and gives more trouble in maintenance, but it eliminates any possibility of accident through released springs.

Along with this illustration is shown a cam and the cam heel. We make it a practice to keep these cams and heels away from the front or operation side of the die, even going to the expense of spreading them far enough apart to clear the panel. This increases the ease with which the panel can be loaded to and from the die, and eliminates the possibility of injury from the cams.

With the present method of rushing dies through for new models, the designer often neglects to give sufficient attention to the operation of his die in the press, and unless he does give some thought to loading and unloading to and from the die, he fails to create a well-balanced design, and the die remains a constant source of danger throughout its entire life.

Every foreman should endeavor to keep his men keenly interested in safety, for we cannot place the responsibility of all accidents on designers alone.

Steel Ways and Scraping—Discussion

K. H. CRUMRINE

Continuing the discussions of John R. Godfrey (*AM*—Vol. 77, page 638) and Robert S. Alexander (*AM*—Vol. 77, page 811) on the above subject, Mr. Godfrey correctly says that with hardened steel ways grinding is the only available method of finishing, whether done either before or after application. Regarding the finishing of ordinary cast iron ways, however, there are, aside from appearance, a number of reasons why they are still scraped by hand.

Force of habit is, perhaps, the first reason to be mentioned, since scraping is the continuation of a process dating from the origin of all accurately straight and flat surfaces on metals. The first really flat, and therefore straight, surfaces were generated by the three plate method (perhaps almost forgotten today by the older generation, and little known by the younger) and by "pecking away" with whatever primitive tools may have been available until the desired results were obtained. For a very long time there was no other method available for producing such surfaces. Thus, the process became firmly established as a suitable and proper method for finishing flat and straight machine parts which must be as accurate as it was possible to make them.

Now that grinding methods are so greatly improved and efficient it is quite natural to think of grinding as a likely improvement over scraping on such work, and considerable thought has been given to this possibility in the past ten years. The removal of metal by grinding is undoubtedly faster than by scraping and the resulting surfaces are straight, true, and of a finish which, if well done, would seem to be highly desirable. However, there seem to be certain objections to grinding on machine ways which leave scraping not so badly off as it might appear.

It has only been in recent years that equipment of suitable accuracy and size for grinding the ways of machine tools has been available, even for those who could afford to buy it, and the cost of such equipment is considerable since it must be of the highest grade, while the cost of scraping equipment is practically nil.

As for the labor of scraping, it is doubtful if many skilled scraper men regard their work as particularly arduous unless the previous machining has been carelessly done. With modern planing and milling equipment and reasonable care on the part of their operators this need not and should not be the case, since with such reasonable care almost no scraping should be necessary to bring the bearing surfaces to perfection.

When machine ways are ground there is no possibility of further correction if there is any error, except, of course, to reset and regrind. This means, therefore, that while the actual grinding is no doubt more rapid and economical than scraping, the preparation for grinding is an extremely painstaking and consequently costly operation. It is, in fact, the writer's understanding that one prominent machine tool builder, some years ago, prepared elaborately to grind all the slideways on his equipment, and afterwards abandoned the process as too expensive. Again, the construction of many machine tools is such that the ways cannot be readily gotten at, if at all, with proper grinding wheels.

It is probable that there is little if any difference in the value or wearing qualities of a machine way properly scraped and one correctly ground. It is doubtful if the so-called oil pockets on a scraped sliding surface have any value whatever, since it is really the oil film between the sliding parts at the high spots which actually provides the necessary lubrication.

It is likely, however, that the broken surface thus produced, as contrasted to the straight grained surface produced by the periphery of a grinding wheel provides definite advantages toward wearing in to a perfect bearing. On the other hand, a ground surface produced by the face of a cup wheel should wear equally well.

Considering, therefore, the cost of suitable equipment, the necessity of perfect preparation for the actual grinding, the lack of any particular advantage of the ground surface, and the assurance of a good wearing surface from scraping, to say nothing of the pleasing appearance of the scraped surface, it seems likely that as long as flat bearing surfaces are not too hard they will be finished by the scraping method.

IDEAS

FROM • PRACTICAL • MEN

Jig With Parallel Clamp

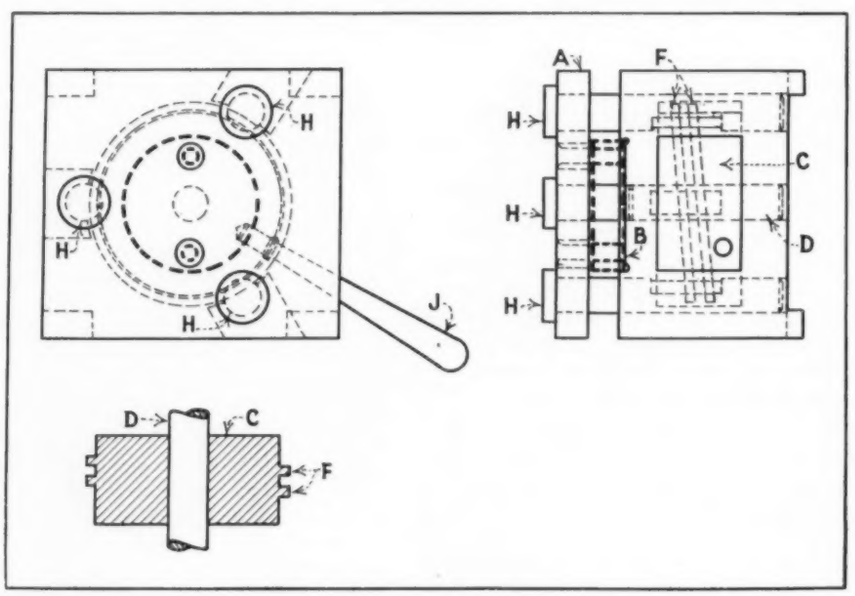
FRANK HARTLEY

Work that has been roughed out often lends itself to being clamped in a jig by a single-operation clamp moving in parallel.

In the jig illustrated, the clamping plate *A*, which is also the bushing plate, is kept parallel with the work, equalizing the pressure at all points. While the jig was designed for drilling two holes in the cylindrical piece indicated by heavy dotted lines and held in the nest *B*, it can be adapted for various types of other work.

The base of the jig is bored to admit the cylindrical member *C*, which is free to rotate on the stud *D* and has two coarse threads *F*. These threads are more plainly shown in the sectional view in the lower left-hand corner of the illustration. The three clamping bolts *H* have internal threads on their inner sides to engage the threads on the cylindrical member *C*, to which lever *J* is attached.

When lever *J* is moved to the left, the cylindrical member is rotated, and as its threads are engaged by those on the bolts, the bolts are pulled down, bringing with them the clamping plate and clamping the work.

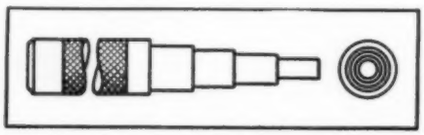


The three clamping bolts are moved in unison by threads on the rotating cylindrical member engaging internal threads cut on their inner sides

A Bushing Driver

C. F. FITZ

When bushings or bearings are to be driven in or out, pieces of metal to be used as drivers are not always at hand. Time and trouble can be saved by making several sizes of drivers like the one illustrated. They should be made of steel, hardened and tempered. They can be used either in the mandrel press or with a hammer.



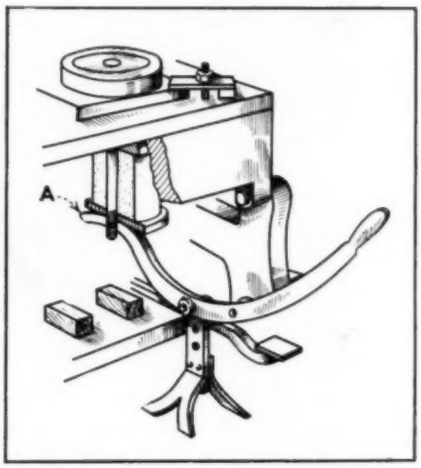
For driving bushings or bearings in or out, this tool will be found very convenient

Jack for Raising Buffers Under Large Presses

CHARLES H. WILLEY

Any die setter placing an old-type rubber buffer for pressure on the draw plate of a large press will appreciate the home-made jack illustrated. The space beneath the beds of all presses is limited, and it is a mean job for one man to hold the buffer in place while he screws the nut on the suspension bolt. It is a much quicker and easier task when the whole buffer assembly is raised with the jack by a helper, while the die setter guides it into position and screws on the nut.

In use, with the buffer assembly placed on blocks on the floor below the press bed, the curved end *A* of the jack lever is slid under it on one side of the bolt hole. The helper raises the essembly with the jack and the die setter guides it into position and screws on the nut.



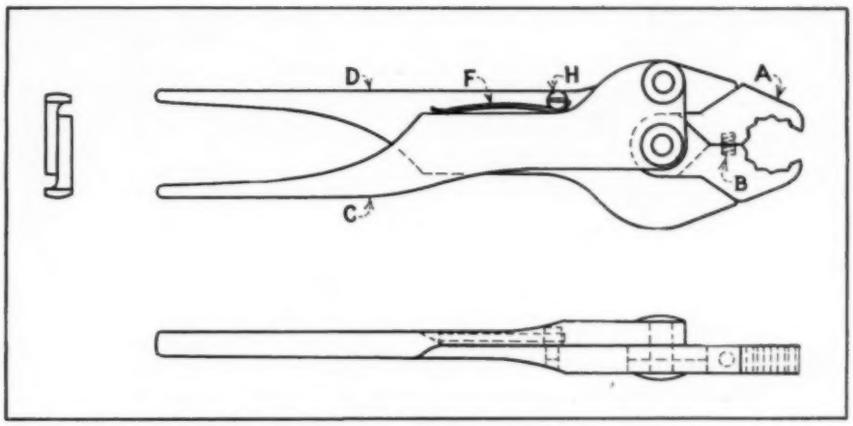
With the helper raising the buffer with this home-made jack, the die setter can easily guide it into place and screw the nut on the suspension bolt

Ratchet Pliers

OSCAR W. NOWLIN
Oshawa, Ontario, Canada

Several nuts on a recent model automobile were located in such a place that they could not be reached by any form of power wrench, and a ratchet wrench could not be used because the nuts were too close to obstructions. The use of an open-end wrench slowed the operation to such an extent that it interfered with other operations on the assembly line. To overcome the difficulty the tool illustrated was devised.

Essentially, the tool consists of the



Where nuts are in close quarters and an open-end wrench is too slow, this tool can be used to advantage

jaws *A*, broached to suit a hexagon nut; the small coiled spring *B;* the handles *C* and *D;* the flat spring *F;* and the slotted pin *H* to anchor the flat spring. Spring *F* normally holds the handles open, permitting spring *B* to open the jaws far enough to rotate freely about the nut without turning it.

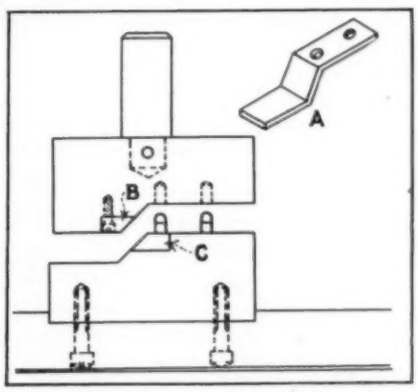
In use, pressure on handle *C* in a clockwise direction closes the jaws on the nut. Continued pressure in the same direction will turn the nut as far as circumstances will permit. Releasing pressure on handle *C* and pressing handle *D* in a counterclockwise direction will release the jaws and return the tool to the starting point without turning the nut.

Cast-Iron Dies Discussion

PETER L. BUDWITZ

The article by Chester H. Franklin under the title given above (*AM*—Vol. 78, page 591) reminded me of some cast-iron dies we made for bending the piece *A* in the illustration. Both the punch and the die illustrated are cast iron, and they stood up well for the limited number of parts produced. Later, when filling a repeat order for a larger quantity of the same parts, the tools began to show evidence of wear at points *B* and *C*. Hardened steel inserts were set in at these points, rendering the tools practically immune to wear. The punch shank is cold-rolled steel and is pressed into a hole bored in the punch and then pinned to prevent it from turning.

Because of the comparative cheapness of cast iron and the speed at which it can be machined, it is a desirable material for low-cost tools to be used for limited production. However, the toolmaker may experience some difficulty in shaping such tools to the required contour, due to the cutting tool breaking out the iron at the edges on which the lay-out lines are scribed. This condition can be easily remedied by chamfering the corners from the flat surface to the lay-out lines after the roughing cut. The shaping can then be continued.



The life of cast-iron bending tools may be prolonged by putting in hardened steel inserts at points of greatest wear

Using the Dial Indicator on a Magnetic Chuck

HECTOR J. CHAMBERLAND

There are many surface grinding jobs where a dial indicator would be convenient for checking work held on a magnetic chuck, but the magnetic force will prevent the needle from moving freely. Even when the current is turned off there is enough residual magnetism to give trouble in this respect.

The trouble can easily be eliminated by attaching three brass feet to the indicator base, thus breaking the magnetic flow. Incidentally, if paper is put between the work and the chuck it will protect the chuck from being scratched.

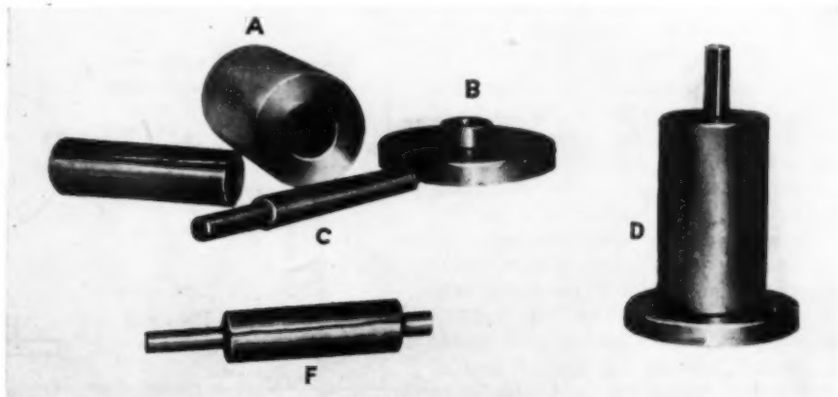
Mold for Casting Lead Laps

FRED B. JACOBS

Suitable laps for finishing the holes in hardened jig bushings, cam rollers, etc., are not readily obtained at short notice, but any toolmaker can make the outfit illustrated in a few hours, thus enabling him to cast lead laps quickly and easily.

The outfit consists of the mold *A*, the base *B* and the spindle *C*, all of cold-rolled steel. The spindle, on which the lap is cast, is tapered ¼ in. per ft. and has a half-round groove milled lengthwise of the body to prevent the lap from turning. The assembled mold and a finished lap are shown at *D* and *F*.

Pure lead is generally too soft for laps and they should be made of a mixture of one part tin and six or seven parts lead. After the laps have been cast they are turned to the desired size and are split lengthwise on the side opposite the groove in the spindle with a hacksaw. This permits adjustment for wear, as the laps can be expanded by driving them up on the tapered spindles.

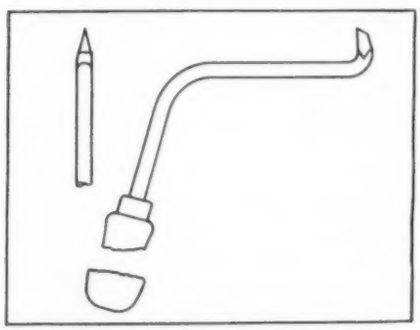


The laps are cast on a tapered spindle placed as a core in the mold. They are then finished by turning to the desired size

Tool for Cutting Sheet Metal

M. G. DEMOUGEOT
International Banding Machine Company

In the accompanying sketch is shown a handy tool for cutting large sheets of brass, aluminum, zinc or other soft metals into smaller pieces without distorting the sheets, as would be the case if a cold chisel were used. In the average shop not having a machine for cutting sheet metal, this tool will be found useful. It is made from ¼-in. drill rod, bent as shown, and the point is hardened and tempered.



Guided by a straight-edge, the tool is drawn along the layout line, pressing downward. Repeating this operation several times will cut through a sheet of soft metal

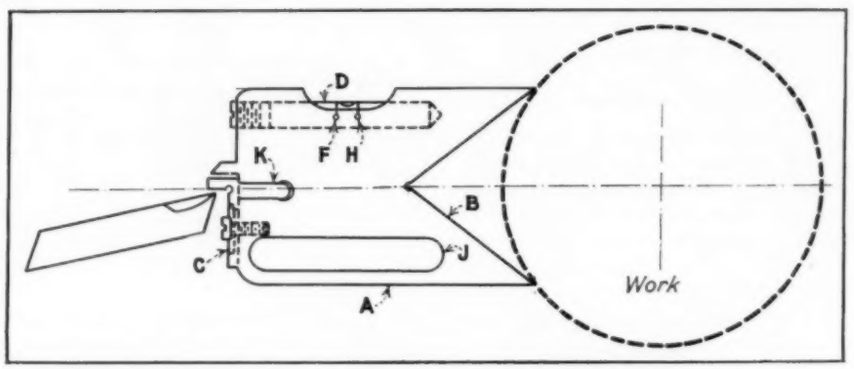
With the sheet laid out for the pieces to be cut from it, any convenient piece of flat steel is clamped close to one of the lines as a guide. Then the point of the tool is drawn along the line, pressing downward. This operation is repeated until the sheet has been cut through.

Gage for Setting Lathe Tools

GEORGE J. MURDOCK
Murdock Research Laboratory

The gage illustrated is for setting lathe tools in relation to the center height of the lathe. Essentially, it consists of the rectangular steel block *A* having an angular opening at *B;* the adjustable gage *C;* and the spirit level *D* at the top.

In use, with the device correctly adjusted and held against the work as shown, the under side of the lip on gage *C* resting on top of the tool, the tool is at center height when the level bubble is central between the lines *F* and *H* etched on the glass. If the bubble is out of center toward the work, the tool is below center height. If the bubble is out of center away from the work, the tool is above center height. Thus, the device can be used to set the tool at, above or below center height.



With the device held against the work in the position shown, the lathe tool can be accurately set to center height

The device is usually held against the work by the left hand, the fingers grasping by the milled depression *J*, while the tool is adjusted with the right hand. It is sometimes convenient to hold the device against the work by a rubber band looped about the work, the loops at the free ends being caught in the slot *K*, leaving both hands free.

Scribing Circles in Different Planes—Discussion

EMIL WITTMANN

The device described by C. W. Putnam in an article under the title given above (*AM*—Vol. 78, page 23), reminded me of a device that I made for the same purpose.

A 2x3-ft. square of a cheap grade was equipped with two sliding members or runners, as shown in the illustration. A center-punch mark was made in each runner in line with the inner edge of the square. From the center-punch mark, an index line was scribed parallel with the graduations on the square.

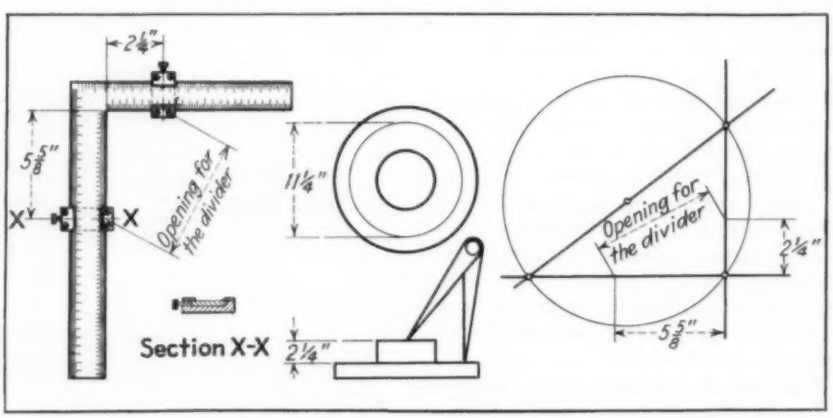
For the example given by Mr. Putnam, one of the runners is set to 5⅝ in. and the other is set to 2¼ in. The distance between the center-punch marks on the runners is the distance to open the dividers to scribe a circle 11¼ in. in diameter from an elevation of 2¾ inches.

If one has occasionally to scribe a circle at a plane differing from that of the center, the scheme shown at the right in the illustration can be used. The diagram is laid out on a piece of thin sheet metal and follows the well-known geometrical axiom of the peripheral angle over the diameter of a circle as a means for constructing an accurate right angle.

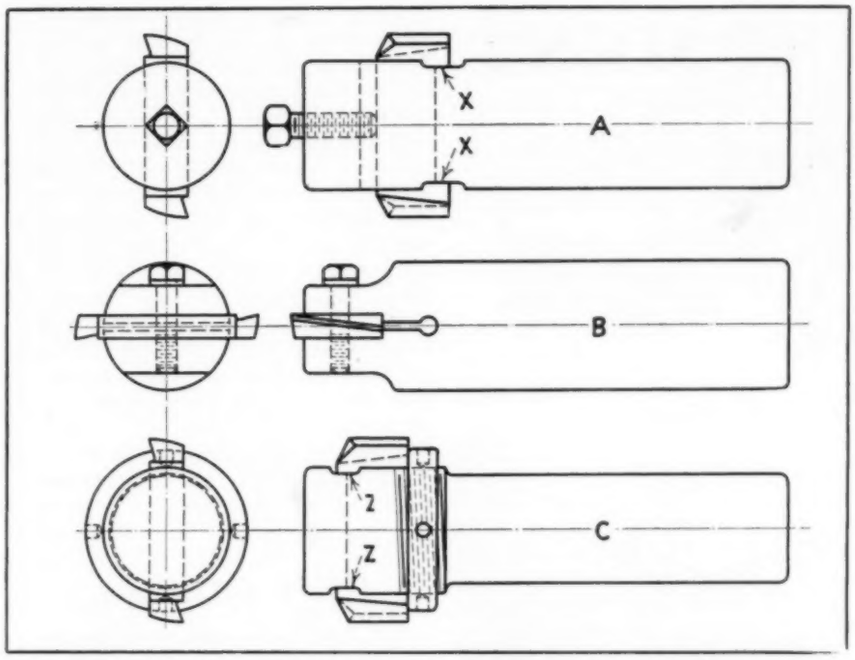
Three Types of Boring Bars for Turret Lathes

F. SERVER

A short time ago a machine shop foreman in speaking of the tooling for a part in the turret lathe, said "Use a plain



The amount to open the dividers for scribing a circle of given diameter from an elevated center is the distance between the center-punch marks on the runners



Boring bars for turret lathes are of many types. These three bars are for general use and each one will do the work with equal accuracy

boring bar." Just what type of bar did he mean? He may have meant a bar having either a single- or a double-point cutter, or a piloted bar, each of which would do the work, but with varying degrees of accuracy.

Three designs of boring bars for turret lathes are shown in the illustration. In the bar *A* the cutter passes through a slot in the bar, in which it is located centrally by the two flats *X*, and is clamped by an axial screw at the end of the bar.

Bar *B* has an open slot at the end and is slit beyond the cutter seat, the slit terminating in a crosshole. The cutter is clamped by a central cross screw that passes through it, locating it centrally.

Referring to bar *C*, the cutter is located centrally by the flats at *Z* and is clamped by a collar nut fitted to the threaded portion of the bar just behind the cutter.

A Hollow Mill Adjustable for Shoulder Length

H. M. FAY

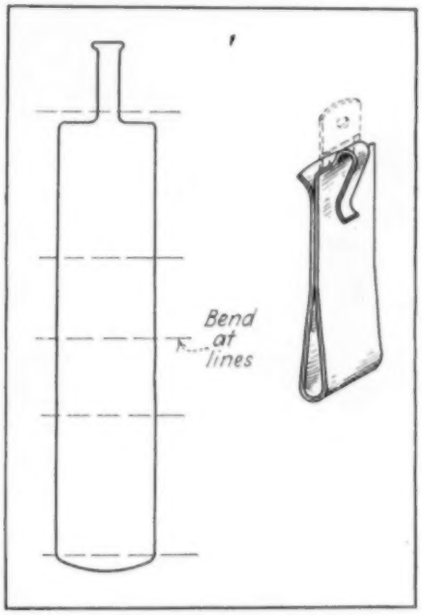
A type of hollow mill in which the cutter is separate from the shank is shown in the illustration. The taper shank is threaded at *A* for the collar nuts *B* and *C*. The cutter *D* is held on the taper end of the lower part of the shank and is positively driven by the two pins *F* in the shank engaging slots *H* in the cutter. See small view at top. Collar nut *C* is so adjusted that when it contacts with the top of the jig bushing, the shoulder length of the piece being machined will be correct. After the adjustment has been made, collar nut *C* is locked by screwing collar nut *B* tightly against it.

A Pocket Scale Holder Discussion

J. B. BOOTH
Bradford, Yorkshire, England

In an article under the title given above (*AM*—Vol. 78, page 581), Paul C. Bruhl describes a neat clip for holding a flexible scale in the vest pocket.

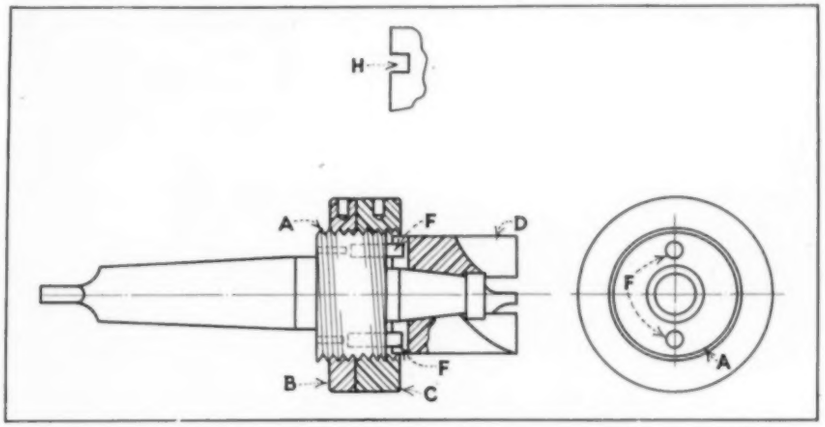
In the illustration is shown a device for the same purpose, which I think has certain advantages over the one described by Mr. Bruhl. It is easier and simpler to make, as the coil spring is omitted. It is not so bulky and it provides a kind of extra support for the pocket lining. All that is required is a



This pocket clip for the scale is made from a single piece of spring steel. It is easily made and is not bulky

single piece of spring steel about 7 in. long which is suitable for holding a 4 in. scale. This is cut and bent to shape along the dotted lines as illustrated. The width of the steel may be varied but should, of course, be somewhat narrower than the pocket.

The same type of clip will hold any reasonable number of scales without unsightly bulkiness of the pocket.



Pins in the shank engaging slots in the cutter provide a positive drive. The collar nuts permit adjustment for shoulder length of the piece being machined

SHOP EQUIPMENT NEWS

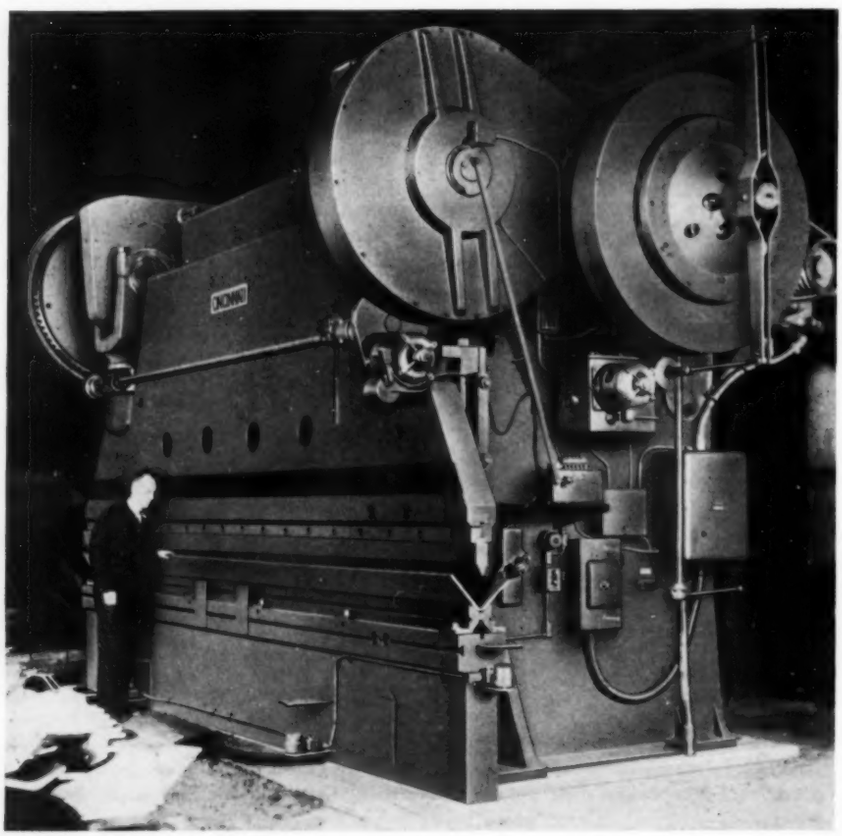
Cincinnati Press Brake

The largest machine of its type ever built for bending, flanging, forming and multiple punching has recently been completed by the Cincinnati Shaper Co., Cincinnati, Ohio. It is constructed to handle steel plates up to 2 in. in thickness in lengths up to 12 ft. and ¾ in. plates in lengths up to 18 ft.

The ram has a stroke of 6 in. and an adjustment of 6 in., with a distance of bed to ram, stroke down and adjustment up, of 14 in. Two speeds are provided through a gear shift transmission so that the machine may be operated at either 5 or 20 strokes per min. The clutch is hydraulically operated by electrical control and is contained in the outer face of the flywheel. One set of five dies gives complete range for general-purpose work. Safe working loads up to 1,000 tons can be developed by the machine. Independent adjustment to each end of the ram is provided to take care of fade out or cone work.

An interesting feature of the design of the machine is the employment of a divided pitman which, in conjunction with the cylindrical supports for the bed and ram, assures that the load of the press brake is carried directly on the centerline of the housings, thus avoiding eccentric loading. Ram adjustment is by independent motor. Dial indicators show the position of the screw or the ram in relation to the bed and also the position of each screw with reference to the other.

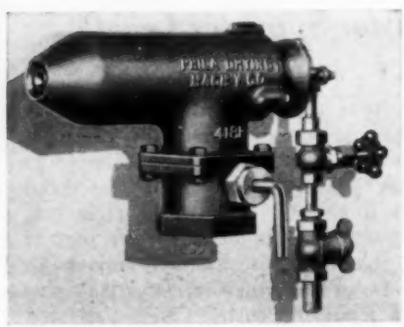
Several electrical control stations are arranged with cut-out switches so the machine may be operated from any one station or may require the operator at each point to push his button before engaging the clutch. The control further permits making either a complete cycle with the stop at the top, or continuous running, or a jogging operation. An oiling system supplied with two stations, one on each housing, furnishes complete automatic lubrication. Total weight of the machine is approximately 145,000 lb.



P.D.M. Oil Burner

The P.D.M. low-pressure oil burner, developed by the Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa., is designed to achieve: efficient combustion, more uniform heat distribution, close atmospheric control, freedom from dribbling, and safety from explosion.

Efficient combustion over a wide range of capacities with various grades of fuel is attained by a design which governs the regulation, distribution, velocity and turbulence of the primary and secondary air as it comes into contact with the oil. Oil enters through a small supply line at the back, and passes through a central oil tube to a distributor inside the burner housing. Air enters through a butterfly valve in the center lower portion of the burner housing, whence part of it enters the distributor head, passes through the primary air orifice and then through a venturi. A partial vacuum is created so that oil is withdrawn in a thin film around the air. This film is broken into a fine mist as it passes through the venturi. A secondary stream of air flows between the burner body and the outside of the venturi mixer and acts



on the primary mixture to provide further atomization and mixing. Variable capacity is obtained by turning a handwheel at the back of the burner, which causes the venturi to move longitudinally, thus varying the secondary air opening.

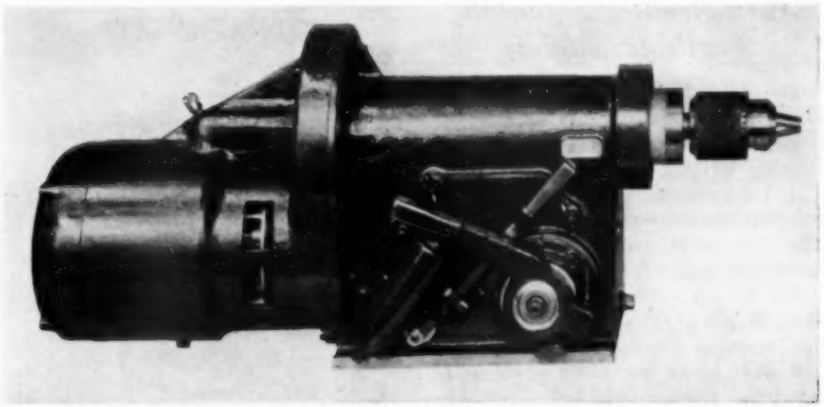
There are nine sizes of burner ranging from ¾ to 6 in. for pressures ranging from 8 to 32 oz. air pressure and for capacities of ⅛ g.p.h and upward.

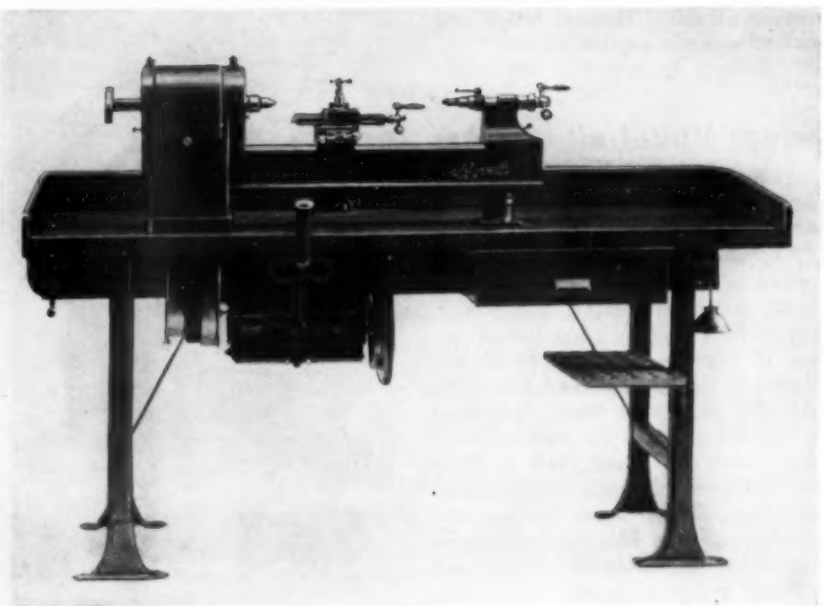
Bradford No. 0 Drilling and Tapping Unit

A small drilling and tapping unit, known as the No. 0, has been developed by the Bradford Machine Tool Co., Cincinnati, Ohio. This unit was designed for use in building up special high-production equipment for drilling, tapping, reaming, spotfacing and hollow-milling. It is a high-speed sensitive unit with a capacity up to a ½-in. drill. Being totally inclosed and running in oil with a splash lubricating system, the unit requires no attention except to maintain the oil level. The spindle and quill are supported front and rear at all portions of the stroke. The stroke is obtained by a positive-return, double-track cam. A friction clutch, which can be adjusted to slip at any desired pressure, drives the feed. Spindle speeds are from 525 to 8,750 r.p.m. in 63 steps variable by pick-off gears. The unit can be furnished with any stroke up to a maximum of 2¾ in. and with any feed, or combination of feeds, within the range of the tools. By adjusting a setscrew the cycle can be made continuous. The standard motor furnished is a built-in, ¾-hp., 440- or 220-volt, a.c. motor. Its action is automatic and includes a rapid approach to the work, feed or feeds, rapid return and stop.

Pease Blue-Print Papers and Cloths

The C. F. Pease Co., 813-821 Franklin St., Chicago, Ill., is making a paper and cloth for blue-prints and blue-line prints that will not "bleed." The Pease "K" speed paper or cloth prints may be fully exposed, even over-exposed, and still produce a deep blue and permit the whites to stand out clearly. The "K" speed papers and cloths are available in all standard lengths, widths, weights and rag stock content, and in rolls or standard cut-sheet sizes.





Rivett Inclosed-Head Lathe With Motor-Driven Speedbox

The Rivett Lathe & Grinder Corp., Brighton, Boston, Mass., is manufacturing a bench lathe of inclosed-head design with a hinged cover giving access to the cone pulley. A removable end plate permits convenient replacement of the endless cone belt. The unit is offered with 6, 12 or 18 selective forward or reverse speeds in steps from 200 to 3,000 r.p.m. At a touch of the hand or body of the operator the speedbox lever disengages and flies to neutral, and an automatic brake instantly stops the driving cone pulley without stopping the motor. The speed box employs helical, fabric and cast iron gearing constantly in mesh and uses a multiple steel clutch.

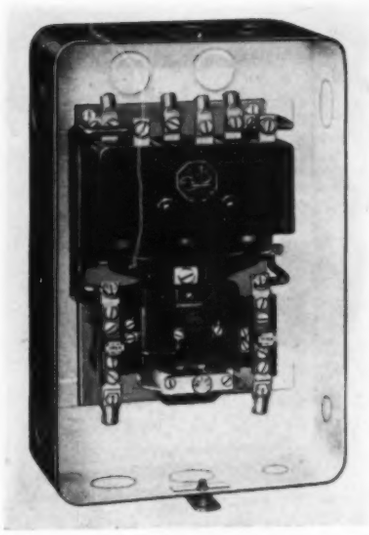
The headstock spindle is of 1-in. collet capacity and may be specified with either a tapered or threaded nose for mounting attachments. The bed is in heavy box section and is supported on pedestals affording screw adjustment for proper tensioning of the driving belt. The right pedestal has a spherical depression on its top surface in which is fitted a spherical washer carrying the bed. The bed at the left pedestal is fitted with two steel balls bearing on the pedestal head in traverse line with the bed. This three-point mounting is designed to protect the bed from distortion strains.

The drive consists of a standard ¾-hp., constant-speed reversible motor carried on a swing plate mounted on cork insulation. This plate, when actuated by a toggle lever, is swung forward to release tension on the driving belt when shifting from one pair of steps to another.

Specifications: length of bed, 38 in.; distance between centers, tailstock flush with bed, 17 in.; swing over bed, 8 in.; floorspace, 72x26 in.

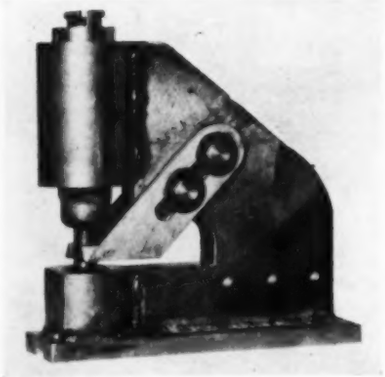
Allen-Bradley Solenoid Starting Switches

The Allen-Bradley Co., 1311 South First St., Milwaukee, Wis., has extended its line of solenoid-operated starting switches by inclusion of 50- and 100-amp. sizes. The size originally announced was limited to 25-amp. The two additional sizes will handle polyphase motors up to 15 hp., 120 volts; 30 hp., 220 volts, and 50 hp. 440-550 volts. The pick-up and drop-out voltages are low. The switches will close at as low as 70 per cent of rated voltage and will not drop open unless the voltage falls below 50 per cent of normal. Thermal relays give protection again overloads.



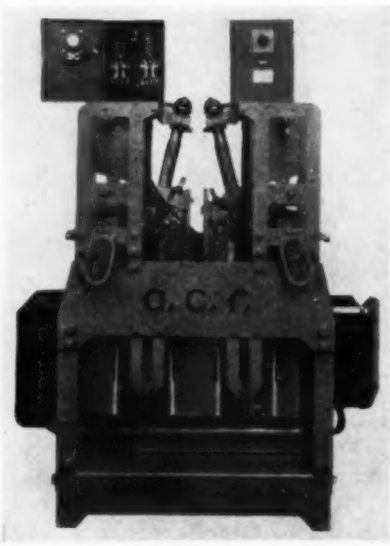
Semco Multi-Unit Punches

A line of standard "Multi-Unit" punches has been placed on the market by the Service Machine Co., Elizabeth, N. J., designed primarily for use in presses or press brakes in place of the usual multiple-punching attachment. The Multi-Unit punch has the advantage of being readily clamped on any centers in the press without the necessity for realigning each individual punch and die as in the standard multiple punch. Standard Pratt & Whitney or Cleveland punch couplings hold interchangeable punches for any size punch required. The punches are removed by unscrewing the coupling and slipping out the punch. Adjustable back gages are provided. The depths of throat provided are 4 and 6 in.



A.c.f. Berwick Electric Automatic Bar Heater

The American Car & Foundry Co., 30 Church St., New York, N. Y., has developed a fully automatic electric heater equipped with electric eyes, for temperature control. Stock, which is cut to length, is placed in a hopper, automatically fed between the copper jaws or electrodes, heated to the temperature for which the electric eyes are set and automatically released, so that the piece falls into a convenient receptacle. This heater will heat any diameter stock from ¼ to 1½ in. or larger, if desired, and will place the heat on the end or at any other point on the bar. Any size stock between 4 and 19 in. long can be handled in this way. The electric eye can be set to operate at any heat desired by moving the dial handle on the front of the box at the top of the machine. Capacity of the machine ranges from 1,200 pieces per hour of the 5-16 in. diameter stock, to 50 pieces per hour on the 1½ in. diameter stock, depending on the length of the heat and the degree of heat desired. On ordinary stock heated to 1,900 to 2,000 deg., the electrical consumption averages about 18-kwh. per hundred pounds. This covers poundage of heated metal, not the total weight of metal. The heater is equipped to operate on any alternating current voltage or cycle.

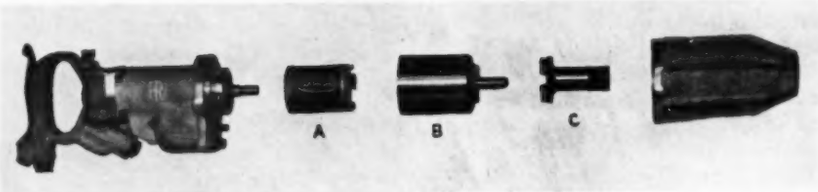


Ingersoll-Rand Pott Impact Wrench

In the Pott impact wrench, developed by the Ingersoll-Rand Co., 11 Broadway, New York, N. Y., a principle entirely new to the pneumatic tool field is brought into play—that of the rubber "accumulator." This is a cylindrical block of special rubber interposed between the "multi-vane" air motor and the chuck. The torque from the motor is applied to the accumulator *A* which, in twisting, becomes shortened, lifting the hammer *B* from engagement with the anvil *C*. The hammer is then released and is spun forward to the next engagement, thus delivering a powerful blow, with considerable mass behind it, to the anvil, on the end of which the chuck is attached.

These torsional impacts occurring at the rate of 1,200 to 1,400 blows a minute exert a powerful turning effect. The accumulator absorbs the torque and eliminates the danger of shock or injury to the operator.

Heavy nuts on locomotives and other machinery can be driven or removed with this pneumatic tool



Rubber accumulator *A* absorbs the torque and eliminates danger of shock or injury to the operator

THE ROUND TABLE

Finish Cuts Only

"Spending more of our good money, I see, Al," said Ed as a truck unloaded a medium sized boring mill at the shop door. "But while you were at it, why didn't you get a good one?"

"Mixing your adjectives again, Ed. You mean why didn't I get a *new* one?"

"What's the difference? Isn't a new machine always best?"

"Mixed again, Ed. You said *good* before; now you say *best*. Of course, I'd rather have had a new machine—of the right make. But I've a good reason for buying this one, though you may not agree."

"Go ahead, Al, I'm listening."

"Well you know, Ed, we have a lot of boring mill work. Some of it has to be pretty accurate."

"So you bought this second-hand mill to get more accurate work?"

"Wrong again. It's getting to be a habit with you, Ed. But you're half right at that, without knowing it."

"More riddles, Al. What's the answer?"

"The answer is I want more accurate work, but not from this machine. It isn't as good as the one we already have, but I want to use it for rough work and save the other for the finishing cuts."

"I thought you didn't believe in coddling machines, Al. Haven't I heard you say that it paid to wear them out as fast as you could?"

"Partly right again, Ed. It pays to get the work out of them in the shortest time. But that isn't the point here. I want to put all roughing work on the boring mill I'm just getting in. I'm going to go over the other mill and put it in first class shape. Then it will only handle finishing cuts and give us better work."

"I still don't see the sense of splitting the work between two machines. Isn't the mill we have doing good work?"

"Yes and no, Ed. It's doing as well as it can when it has to take hogging cuts and fine finish cuts also. But we're taking more time to assemble the pumps than we would if we held our limits to two thousandths."

"If the bearings are O.K. and your man knows how to handle it, I still don't see the need of a second machine," said Ed.

"It's not exactly a new idea," answered Al. "We've always done it with planers when we wanted the best work. I don't see why it won't work out the same way with boring mills."

Is Al right in keeping one boring mill only for finishing? Or will he do better to rough and finish his work in one machine?

Discussion

Trade Schools

Are there still some who will not agree that a trade school is better than the old apprenticeship system? To be sure there are many poor trade schools; and some large shops have apprenticeship methods closely approximating those of the trade school. But for the small shop it is more desirable to start with men having some experience.

In the old days the foreman had little time or patience to explain simple details. Consequently the boy's first year was spent in sweeping the floor and running errands, gaining only as he inhaled the spirit of the shop. That is not true today. But the production foreman is still so hard pressed that he has little time for the instruction of beginners, and is even more handicapped by their mistakes.

We think of this as being the age of specialists. A man who sought a job as a machinist on the strength of his experience in an automobile plant had to admit, when pinned down, that his work was confined to tightening nut No. 406. And yet the terms "drill hand" and "lathe hand" were not coined recently. It was thought absurd for a man to change from one machine to another. A small shop, more than any other, needs versatile men, and the trade-school man is likely to have the more general training.

—Harrison G. Brown,
Supervisor of Standards,
Crompton & Knowles Loom Works.

It is more advisable to employ boys who have graduated from trade schools than to train apprentices in the shop. A few manufacturing plants have comprehensive courses for training apprentices where the training is much like that given in the better trade schools, but such training by industry in general has failed to supply the normal demand for skilled workmen. The tendency in the average manufacturing plant is to keep the boys on profitable work for as long a time as possible. Such systems of training are hardly likely to provide the all-around experience necessary to produce skilled mechanics. In the schools the teacher devotes his entire time to instruction, and thorough training for industry is possible.

Vocational schools, however, are

costly because of the expensive equipment necessary to produce skilled mechanics. Industry has not shown as much interest in this source of future skilled help as it should. It is my opinion that if the machine tool industry would cooperate with industrial schools, it would be assured of trained apprentices and journeymen. The various trade schools have a large quantity of antiquated machines, and industry could help by making liberal allowances for periodic trade-ins, to acquaint pupils with the virtues of modern equipment.

Far-sighted management will appreciate the advantages of having skilled and well trained help for the future, at less cost to them than the installation and maintenance of an adequate apprenticeship system at their own plants.

—Philip F. Shafran,
Teacher of Machine Design, Board of Education, City of New York.

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Writers who have discussed this subject seem to agree that the preliminary training should be given in a trade school and that the finish or high polish should be left for industry.

If the trade schools are to be a part of the public school system, then the problem of teacher supply should receive the attention of some of our best minds. Any department of public education will insist that the teacher be at least a high-school graduate with some credits in teacher training, and if he expects to reach the top on a salary schedule he will need a degree.

To teach even the beginnings of a trade, a man will need something more than just what he can pick up over week-ends. Maybe he ought to serve an apprenticeship, even if it does mean "weeks and months on a bolt cutter," because it may teach him to have patience with the boys who come to him, quite a few of whom will be in the "bolt cutter" class.

Some of us may not agree that it is important to teach boys that screws and gears act the same way in a lathe as in a milling machine because it includes too much. Why not teach them (and girls, too) that screws and gears will always act, but to "stop, look and listen?" —H. E. Todd.
Supervisor, Manual Training, Harrisburg Public Schools.

Must we choose between the trade schools and apprenticeship? Why divide the work between the two?

Under present conditions industry is not prepared to train the mass of ordinary boys. If it employs them, the only place that it has for them is in routine or specialized work in which the chances to learn and advance are small. The trade school can fill this need. It can give the ordinary boy a broad training that will be of value to him when he later steps into some routine job, as the larger number must eventually do.

On the other hand, the trade school cannot give a training equal to the best apprenticeship program. It cannot prepare for executive positions nor for the highly paid positions in the shop. The employer who offers a superior program has a right to select the superior boys, the ones who are able to profit by the opportunities that he offers.

Unfortunately, at the present time the effort is being made to keep the intelligent and ambitious boys in school, and to turn over to the employers the casualties of the school system, whom the employers will not accept as apprentices. —A. W. Forbes.
Forbes & Myers.

Chiseling Chisel Prices

Ed's plan for making prices flexible enough to encourage initiative would permit the wide-awake manufacturer to install new equipment and to scheme better and quicker ways of turning out his product. As an improvement on Ed's plan I would suggest that the government employ a group of specialists in manufacturing costs and methods, these men to be subject to call by any manufacturer wishing to cut prices through a change in manufacturing methods. After a thorough study of all conditions, the government men would make a written report to the manufacturer, then he would make his own decision without any pressure of rules, regulations or laws being brought to force him one way or another.

Under this method the entire procedure would be voluntary instead of compulsory, as suggested by Ed, and much more could be accomplished under a voluntary plan than under methods requiring force, since men will go farther for a principle than they will by being forced. —C. F. STAPLES.

The Better Foreman

In my opinion Al is right in laying more stress on administrative qualities in a foreman than on his being a skilled workman. As regards the relative amounts of administration and skill desirable in any particular foreman, much depends upon the size of the shop and upon the relative size of the department. In a large shop there will be planning and inspection departments, and the foreman's job will be to see that the detail allocation of work in his department is so made that there will be no delay in getting it moving.

A foreman should be a good enough workman to show his men what is wanted and to demonstrate some special requirement of the particular class of work done by the shop, but he should not be expected to teach a man his trade; the man is expected to know his trade when he is hired.

In the small shop, the foreman will still have the administration to attend to, but it will be less in degree than in the large shop. He will be called upon to do more practical demonstrating, both with the new hand and the apprentice. In addition, it is more than likely that on occasion he will be called upon to "give a hand" to help out in some emergency. Above all, a foreman must be a leader rather than a driver, and he must be just in all his dealings with subordinates and superiors—JOHN ATHERTON,
Consulting Engineer,
Heywood, Lancashire, England.

The Little Fellow's Chance

It has long been a favorite axiom in the prize ring that "The best defense is a good attack," the implication being that the fellow who remains too long on the defensive usually collects the loser's end of the purse.

Concerns that are marking time, with their eyes on Washington and making no effort to replace obsolete equipment or to improve the quality of their products, will have a lot of leeway to make up when the business tempo quickens. The pace will be too hot for some, and they will drop out. A large percentage of the little fellows among them will blame NRA and not their own lack of courage and foresight.

There will always be a chance for the little fellow if he refuses to remain on the defensive and is alert and aggressive in his ideas. After all, it isn't the size of the dog in the fight that counts; it's the size of the fight in the dog.

—ROBERT S. ALEXANDER.

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American Machinist

VOLUME 79 AMERICAN MACHINIST ESTABLISHED 1877 McGRAW-HILL PUBLISHING COMPANY, INC. NUMBER 3

K. H. CONDIT F. H. COLVIN
EDITORS

A Capital Goods Year

IN THE following pages will be found a dynamic progress report of metal-working development during 1934. Each item represents a new and improved means of performing certain work, a new part or attachment that will contribute towards such performance or a new material that affords a wider opportunity for selection in product design.

In 1931 and 1932 buying of industrial equipment was stifled by the downward swing of the business cycle, by doubts as to the duration of the depression, and by fears of business executives concerning the solvency of their companies. In 1933 and 1934 a more hopeful outlook prevailed. Lines of business that offered opportunity for quick turnover on short-term commitments prospered; but the heavy industries which depend on a longer time interval to reap the returns of investment still hesitated because of uncertainty as to governmental regulation and as to the extent of the tax burden for care of the unemployed and other social legislation.

In the face of four years of deferred replacement and the stagnation of normal new enterprise, the need for modern capital goods is great. Machines and equipment now in place have been used beyond their economic life because of a willingness on the part of management to allow production costs to rise rather than to risk further capital outlays.

But now a clearer picture is seen. An Administration policy depending primarily upon revival of private enterprise is avowed. The scope and cost of social undertakings are nearer definition. Uncertainty is giving way to a mature realization as to what must be faced and the means to be used.

IT WOULD seem, therefore, a not too foolhardy prediction to say that during 1935 the capital goods industry will follow the consumer goods industries in the path of the upswing. The industrial need is urgent, idle funds press for employment, and the future seems less cryptic than at any time since the start of the depression.

22nd SHOP EQUIPMENT REVIEW

There are 720 abstracts in this 22nd review of metal-working equipment and accessory equipment described during 1934. Of this number 420 items are of American manufacture and 300 items of European origin. The latter are the products of British, German, Swiss, Czechoslovakian, Swedish and French makers. Thus, the new products of the principal machinery-producing nations of the world are assembled and classified in one number for ready reference and comparison.

American vs. European Markets

In this number there is a decided contrast in the classes of equipment offered by American builders on the one hand and European sources on the other. Among the general-purpose machines there is only one American horizontal boring machine as compared to twelve European offerings. In the drilling machine classification there are but two vertical machines and one radial machine from American builders, as contrasted to seven vertical drills and five radial drills from British and Continental makers. During the year there were no engine lathes, except bench types, put out by manufacturers in the United States, whereas thirteen new designs were announced by the European manufacturers. Automatics were offered by both groups, and grinding machines were the largest classification offered by all makers. So far as American markets were concerned, the fields for grinding machines, automatic and turret lathes, and the newer machines, such as precision boring machines and surface broaching machines, appeared most likely of development. General-purpose machines were offered in great number by European firms, but automatic lathes and turret lathes were given considerable attention, indicating that tariff reasons or an increasing desire for mass production have given impetus to their development.

Many hints of trends in design and application of production equipment and accessories are found in the 47 pages devoted to abstracts of American equipment. For example, considerable advancement has taken place in the design of tube bending machines. These are principally intended for production of curved tubular-supporting members used in modernistic furniture and in seat frames for certain automobiles. In the boring machine classification there is a horizontal machine that has a unit head incorporating the drive, feed and traverse mechanisms and designed with an eye to attractive appearance as well as modern control. For mass production of chucking work there is a large boring mill having two rail heads and two side heads, and utilizing a hydraulic gear shift to enhance the operating efficiency. For small work there is a line of eight-spindle vertical turret lathes with combined mechanical and electrical controls for fiexibility both in production and in changing from one job to another. Continued development has been going on with respect to precision boring machines that use cemented-carbide or diamond tools. Perhaps the largest machine to date is a 5-ton unit with four boring heads. Great precautions have been taken in this machine to prevent vibration. Besides the addition of much weight to obtain rigidity, care has been taken with the V-belt drive to the boring spindles, placement of vibration dampeners under the motor, use of flexible connections where possible and provision of a large oil tank and much metal in the tank to dissipate heat without causing inaccuracy.

Surface Broaching

Surface broaching is an operation that has rapidly come to the fore in the last year or two. It can be safely predicted that much further development will come about in the very near future. During the early part of 1934 the art of surface broaching was applied extensively in the automobile plants and some very worthwhile savings have been made. Some surface broaching machines have the broaches working in the vertical plane. Still another type has an annular broach table which is stationary, the revolving work table being placed in the center. Broaches are curved to coincide with the path of the work. A so-called "broaching lathe" is an outgrowth of the crankshaft turning lathe and is so applied. As usual the shaft revolves in pot chucks, but cutting tools consist of vertical broaches that machine the main journals and face and shoulder as well.

Among drilling machines is one that has a hydraulic cylinder mounted directly over a stub spindle and applying feeding pressure thereto without loss of power. Another has the motor-on-spindle construction.

Several jobs can be done simultaneously on a hobbing machine, and each unit functions independently and automatically. A high-speed index on a gear chamfering machine allows production of 150 teeth per min. Multiple lapping members are used on one machine to lap cluster or herringbone gears.

Grinding Cemented Carbides

Cemented-carbide tools introduce problems in grinding and lapping. Several more machines have been developed for one or both purposes. In this connection the new diamond wheels eliminate the lapping operation and give faster and better results than other types of wheels. Included with internal grinders are: A small machine in manual and automatic models; a unit for long sleeves or airplane cylinders; an internal race grinder, and an internal centerless machine. Needless to say the last is distinctly new. It is automatic in operation and straight or

tapered bores are held to very close tolerances. Surface grinders also show new ideas. One small machine has "knee-action" control which moves the table longitudinally and laterally. Of course, the table rests directly on a ground plane surface and has no ways. Another surface grinder has a ring wheel set flush in a center table or plate, whereas the feed table is vertically adjustable in relation to the fixed wheel to take the desired cut. New products call for new machines. As a case in point, there are the three grinders for the ends of the large coil springs used in the independent wheel suspensions used on motor cars. Grinding of spiral-bevel and hypoid gears for the same field has been speeded up to such an extent that the time is now less than that for cutting the gears. This is accomplished in a machine designed to use a flaring-cup wheel.

In a full-automatic lathe the carriage, tool-slide feeds and the rapid traverse are actuated under the auspices of magnetic clutches. Limit switches control the diameters and lengths of cutting. A line of four-spindle automatic screw machines has a very accessible tooling section, and production capacity is enhanced by rapid, smooth indexing. A turret lathe has the motor-on-spindle construction and the four speeds are selected through a drum controller and relays. Speeds of this lathe and of at least another turret lathe are suitable for the use of the cemented carbides.

Automatic Milling

Automatic table control and higher speeds and feeds are outstanding developments in milling machine design. A manufacturing type has either manual or automatic control, the latter giving at least four cycles. An hydraulic unit is incorporated in the saddle and two plungers actuate the automatic reversal and rapid return. A small plain machine has an automatic cycle, rapid traverse at 400 ft. per min., spindle speeds to 1,800 r.p.m., and table feeds to 80 in. per min. A small vertical miller has been fitted with a detachable tracing arm and templet table by which dies and molds can be duplicated to within 0.001 in. So that standard machines can be utilized for die-duplicating work, there have been developed two attachments. One is a mechanical type with the cutter movements under electrical control and is adaptable to knee-type millers. The other, which is hydraulically controlled, is offered for use on knee-type millers or on horizontal boring machines. The movements of the tracer actuate hydraulic valves that raise and lower the milling machine knee or move inward or outward the spindle of the boring machine.

Since much machinery and equipment is fabricated from steel plate it is natural that several new flame-cutting machines have been developed in large and small capacities. One such machine can employ as many as six torches. Welding machines have been developed for such diverse purposes as: for welding special alloy steels, wire products, automobile-body details, seams in non-ferrous and ferrous metals including the corrosion-resistant steels; for joining forgings to tubular stock, and for assembling half spheres for headers of domestic refrigerators. Recent studies of the qualities of welds produced on resistance welders have emphasized the importance of timing the current flow. Electrical equipments have been brought out for this purpose in four designs.

European Machines

European machinery builders were considerably more optimistic during 1934 than during 1933. The totals of new machines and accessories reviewed for these years are 300 and 253 items, respectively. Many of the new machines were exhibited at the Olympia Show (British) and the Leipzig Fair (German).

One of the larger classifications of European tools is that of boring machines. Spindles of the horizontal machines range up to 8⅝ in. in diameter. Several of the boring mills are intended for car-wheel work, and both ram-type and turret-type models are described. One turret-type boring mill is designed to use cemented-carbide or high-speed steel tools. For very large work there is a boring mill that allows moving the uprights backward and away from the table to handle large-diameter turning operations, while an overhanging arm carried on the crossrail reaches to the center for boring operations.

An innovation in sensitive drilling machines is a model having the spindle driven by air at speeds up to 80,000 r.p.m. A special feeding arrangement has been applied to prevent breaking the drill, of which the maximum size taken is 3/32 in. To secure the advantages of two tups working from top and bottom, but without an extra deep foundation, a swaging hammer has the tups connected by a flexible steel band running over a pulley. The Fellows principle is employed in a German automatic gear shaper. Syncromesh gearboxes are now being used in European cars, and therefore gear chamfering machines have been developed.

Grinding machines constitute the largest classification among European machines. Grinders and lappers for the cemented-carbides are of somewhat different arrangement than in American models. Roll grinders developed by English and German builders are intended for the tin plate and paper trades. One Swedish and two British centerless grinders indicate an increasing demand for this class of production machinery. Large sleeves can be taken in one internal grinder and two other machines of somewhat smaller capacity will grind the general run of work. For some years there has been built in Europe a class of surface grinder adapted to the grinding of machine tool ways and slides. The machine reviewed has the table under hydraulic control and the motor mounted directed on the wheel spindle to minimize vibration on finish cuts. Very fast indexing is claimed for a gear grinder intended for large batches of small gears and stem pinions. Whereas in America most manufacturers of small tools and gages use special machines not commonly on the market, the European machine builders still offer such special-purpose machines. For example, among the grinders there are shown two special machines for production of snap gages, and elsewhere there are machines for the production of twist drills. Automatic sizing controls as developed in Europe are quite different from American designs. In one device for use on cylindrical grinders the interruption of a light beam by the gaging pointer actuates the machine control. Another sizing device speeds up the production of multi-diameter work. The principle is the accurate recording of the forward movement of the wheelhead.

Pre-Selective Headstock

Lathes in semi-automatic and automatic patterns appear to be in greater demand to judge from the number reviewed. What is understood to be the largest chucking machine built so far in Great Britain swings 26 in. over the bed and 16½ in. over the cross-slide, and turns a maximum length of 18½ in. Turret lathes are also offered in large number. For this class of machine one English company has developed a pre-selective headstock so that any desired speed can be obtained when required by throwing the main driving-clutch lever. Three clutches are used in the headstock.

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Bending Machines

Bending Brake, Press-Type

Steelweld Machinery Co., E. 70th & Machinery Ave., Cleveland, Ohio. (Vol.78,p.813.) 399.

A throat 18 in. in depth enables the user to turn up larger flanges than customary in this type of machine for the entire die length. All sizes are twin-gear driven and the eccentric shafts are solid forgings. The eccentric comes immediately above the ball joint, which is a steel cylinder welded into the ram. Clutch and brake are of twin-disk design and are mounted on the opposite sides of the housing to prevent overheating. The ram can be swiveled so that on a 10-ft. machine taper work up to ¼ in. taper per ft. can be done.

Bending Roll, Angle

Williams, White & Co., Moline, Ill. (Vol.78,p.653.) 294.

Roll shafts are placed vertically so that the angles can be worked in the horizontal position. Standard rolls are adjustable for all angles within the capacity of the machine. Special rolls can be furnished for rolling I-beams, channels, T's, Z bars, flats on edge, rounds, squares, pipe, tubes and miscellaneous shapes. Standard rolls will handle flats on flat and T's in the plane of the web or flange. Four sizes are built.

Bending Roll, Wrapping-Type

Kane & Roach, Inc., Syracuse, N. Y. (Vol.78,p.168.) 6.

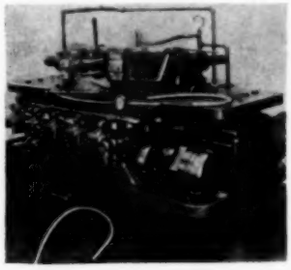
The No. 16-D horizontal roll will bend I-beams used as rims for electric cable reels. The machine bends 3-in. I-beams, 5.7 lb., 6.5 lb. and 7.5 lb. per ft., into rings from 48 to 78 in., internal diameter. Stock is bent to practically a true circle including ends. Power is supplied by a

30-hp. motor. Production is approximately 45 lineal ft. per min.

Bending Machines, Tube, Hydraulic

Williams, White & Co., Moline, ill. (Vol.78,p.294.) 101.

Hydraulic, high-speed, universal and special tube benders are now being offered. Both types are fitted with two motor-driven hydraulic pumps. Flexible dies follow the grooves in stationary dies. Where right-



and left-hand parts are needed, one pair is formed at a time. Before making the bend the operator, after clamping the tubes, inserts ball-ended rods in the tubes and hooks these rods in notches in the ball puller. As the swinging arm, to which the wiping-die cylinder is attached, moves around the stationary die the balls are pulled just back of the center line, ironing out the tubes to the full diameter in case they have flattened because of short bends.

Bending Machine, Tube, Universal

Williams, White & Co., Moline, Ill. (Vol.78,p.783.) 371.

The No. 1½ U will bend up to and including 1½ in. tubing, ⅛ in. wall, 6 in. radius; No. 2-U, up to 2 in. tubing, ⅛ in. wall, 8 in. radius; No. 3-U, up to 3 in. tubing, ¼ in. wall, 12 in. radius, and No. 4-U, up to 4 in. tubing, ¼ in. wall, 24 in. radius.

Features of these machines are as follows: All moving parts are hydraulically driven; the clamp is of the toggle type; either right-hand or left-hand

bends can be made; it is unnecessary to change the machine from right- to left-hand for many jobs; bending pressure is applied directly to the cast steel swinging arm, an adjustable automatic stop and graduated table front cuts the set-up time; the rear of the table is graduated to simplify the setting for the arbor pull cylinder for changes in radius; the bending dies work either right- or left-hand, by turning them over right to left. The cylinder is double acting to push the arbor into the tube before bending and to pull it out after the bend is made.

Press, Forming-Type Straightener, and Shear

Williams, White & Co., Moline, Ill. (Vol.78,p.524.) 210.

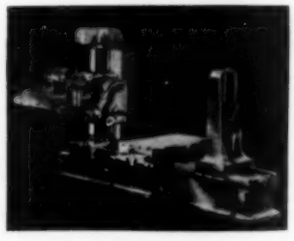
This hydraulically operated press, straightener and shear is adapted to production bending and shearing, to bending and straightening gaggers, and to reclaiming bolts and tie-rods. Hydraulic power is furnished by a self-contained pumping unit. Large volume is supplied at low pressure for the rapid traverse stroke, and small volume at high pressure for the working stroke. Pumps are directly coupled to a 5-hp. motor.

Boring Machines

Boring, Drilling and Milling Machine, Horizontal

Wm. Sellers & Co., 1600 Hamilton St., Philadelphia, Pa. (Vol.78,p.620.) 272.

In this 4-in. spindle boring, drilling and milling machine, known as No. 400, the drive, feed and traverse mechanisms are included in the head, resulting in an addition of weight that adds to the rigidity of the machine under cut. Drive is from the 10-hp. constant-speed a.c. or d.c. motor. A friction-clutch reversing mechanism in the drive permits quick starting, stopping and reversal of the spindle and feed. All feeds are operated from the head motor driving through a spline shaft. Pick-off gears can be provided for thread leads from



1 to 20. Nitralloy is used for the spindle. The sleeve is provided with a 10-in. flange carrying 1-in. square keys for driving milling cutters up to 15 in. in diameter.

The column is of box-type construction and has a spread at the foot of 42x36 in. The distance across the ways is 25 in. A large-diameter fixed screw and rotating nut provide for table travel. Equalized clamps clamp both sides of the table to the saddle. The saddle is also provided with equalizing clamps working on the front and rear ways of the bed.

The auxiliary table is 5 in. wide and 5 ft. or 7 ft. long as required by the customer. The swivel table is worm driven and graduated in half degrees on the periphery. Working surface of the table is 25 in. by 25 in. and provided with T-slots.

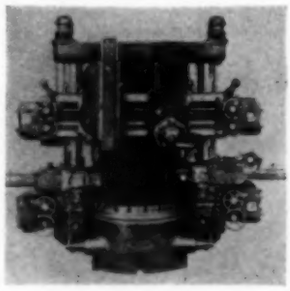
Boring Mill, Side-Head "Hydro-Shift"

Bullard Co., Bridgeport, Conn. (Vol.78,p.134.) 28.

Two rail heads and two side heads on the "Hydro-Shift" boring mill afford complete flexibility in machining large work. Four sizes of machines are built, 56, 66, 76 and 86 in. There is in this machine a hydraulically operated speed shift mechanism with a visible indicator dial. When ready to make the change in speed the clutch lever is moved to bring the table to a full stop and then thrown back into engaged position. In the interval, the gears are hydraulically shifted to the selected speed shown on the dial.

One attachment is designed to operate from either the right-hand main head or the right-hand side head to meet the needs for thread cutting, drum scoring, or scroll cutting. A forming attachment may be affixed to the right-hand side head.

The illustration shows a 56-



in. machine with two heads mounted on the cross-rail. The left-hand head is a ram type for boring, and the right-hand head is a turret type, indexed by means of a crank handle driving through a worm gear.

The one-piece Hydro-Shift side heads are mounted directly upon the ways of the bed. These heads have individual feed works which allow for vertical or horizontal feed of head and slide, respectively. Both cross-rail heads and side heads have quick-acting, direct-reading dial controls located on the end of each feed works, permitting convenient changes.

Turret Lathe, Vertical, Mult-Au-Matics, J-Series

Bullard Co., Bridgeport, Conn. (Vol.78,p.853.) 418.

Mult-Au-Matics, known as the "J Series," are built in two sizes "J-7" and "J-11." Combined electrical and mechanical functions provide flexibility to changeover from one job to another in tool setting and in operation.

The eight spindles allow one station for chucking and seven

stations for working with the speeds independently variable. The initial range for the "J-7" machine runs in 41 changes from 168 to 1,509 r.p.m. For "J-11" the initial range in 41 changes extends from 84 to 754 r.p.m. By means of a dual-range change feature it is possible to obtain a 2 to 1 reduction on all spindles. Total maximum stroke is 10 in. The limiting factors of traverse and feed are the minimum traverse stroke of 1½ in. and the minimum feed stroke of ¼ in. Capacities of the J-7 and J-11 are 8 and 12 in. in diameter, respectively, with a height of 10 in. Chucks are power operated.

Boring Machine, Precision, Bench-Type

Stokerunit Corp., 5325 West Rogers St., Milwaukee, Wis. (Vol.78,p.202.) 48.

The "Simplex" bench-type precision boring machine utilizes tungsten carbide or diamond tools. Specifications: feed

length, 9 in.; rate of feed, 1 to 9 in. as standard, 2 to 18 in. as special; spindle speed, 600 to 6,000 r.p.m.; horsepower, ½ hp. per spindle; feed motor, 1/15 hp.; minimum centers between heads, 5 in., maximum, 9 in.; table width, 9 in.; center line of spindle to top of table, 4 in.; over-all length, 30 in.; and net weight, 410 lb.

In the bed is built a gear-reducer type of feed motor and a feed screw operated by means of pick-off change gears. The boring heads are individually driven by motor. The table carries a lever which engages the feed at any desired point. A limit switch arrangement provides for stopping the table feed.

Boring Machine, Precision, Double-End

Heald Machine Co., Worcester, Mass. (Vol.78,p.626.) 263.

The Style No. 46A "Bore-Matic" is designed for mass production either of an individual part, or for a number of operations on one piece. Maximum diameter of hole bored, 6⅛ in.; minimum diameter, ¾ in.; maximum length of hole bored depends on hole diameter. This is a double-end machine, weighs approximately 5 tons, and has bridges having a capacity of four boring heads.

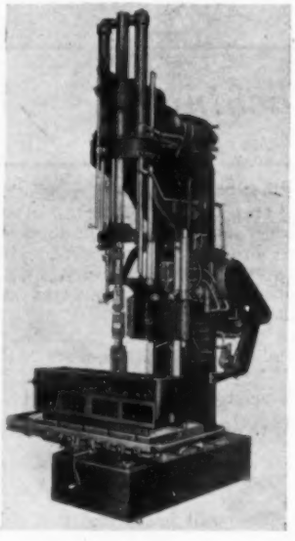
All electrical controls are mounted in one cabinet. Multiple V-belts drive the boring heads from the clutch and brake units. Boring speeds can be

varied from 360 to 3,270 r.p.m. Distance between bridges on the No. 40A is 33 in., standard maximum table travel is 14 in. Boring stroke at one end of the machine may be as much as 8¾ in. but not more than a total of 13 in. on both ends. To change from one cycle to another requires only the substitution of comparatively simple and inexpensive parts such as valve plungers, pipe plugs, and shoulder pins. Should it be desired to set up machine as a single-end machine, with either short or long stroke, the intermediate stop valve may be set to stop the table for loading just inside the outer reversing point.

Boring and Honing Machines, Precision

Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill. (Vol.78,p.690.) 314.

Two sizes of combined fine boring and honing machines have been designed. Size No. 306-C has a 30 in. swing and permits boring and honing 6½



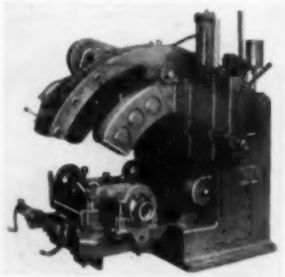
in. in diameter by about 12 to 14 in. deep. The No. 366-C machine has a 36 in. swing but otherwise is the same as No. 306-C.

The twin hydraulic cylinders paralleling the spindle reduce the total height of the machine. One hydraulic pump circuit affords fine hydraulic feed for fine or reboring operations, while the other pump circuit reciprocates the honing spindle.

Boring Machine, Horizontal, Special

Moline Tool Co., Moline, Ill. (Vol.78,p.810.) 380.

A special horizontal machine for boring and facing rear-axle housing has opposed spindles located on curved arms. These arms project downward from the slide toward the work table.



The two lowest opposed spindles are used for the roughing operation, the two center ones for the semi-finishing operation, and the two top spindles for the finishing operation. The spindles traverse as a unit under hydraulic control.

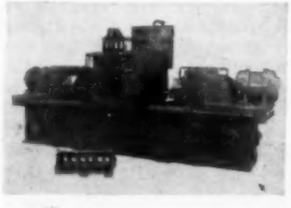
Boring of one-half of the axle housing is done at one setting. The work is clamped in an indexing fixture which rotates 180 deg. to bring the other half of the axle into position. The fixture is mounted on a swinging member operated hydraulically. The overhanging arm in the center has locating holes into which fit opposed plungers for holding the work rigidly. Weight of the machine is 20,000 lb.

Boring Machine, Horizontal, Two-Way

Baker Bros., Inc., Toledo, Ohio. (Vol.78,p.857.) 419.

The equipment illustrated has been furnished for drilling the valve guide and tappet holes in a 6-cyl. motor block of a 1935 car. A second machine is used for two-way boring of the same holes.

The machine has a one-piece bed with finished ways of 24 in. total width. An oil pump is incorporated in the bed at each end. A "Twin-Pull" feed cylinder mounting is used for movement of each saddle. Cylinders are 3¾ in. bore to give an available feed pressure of 18,500 lb. to each head. Rapid traverse speeds forward are 220 in. per min.; rapid return, 180 in. per min. Multiple-spindle heads are mounted to the drive brackets on saddles 40



in. long. The block is chucked on the side, locating from two dowel pins in the pan rail surface. Clamping is done hydraulically. The machine is automatic in cycle.

Boring Machine, Precision

Giern & Anholtt Tool Co., Inc,. 1312 Mt. Elliott Ave., Detroit, Mich. (Vol.78,p.889.)

A "Carbideborer" machine has been developed for utilizing tungsten carbide as a cutting medium. Drive is obtained from a double V-belt. Stroke in the model shown is 18 in. The hydraulic feed varies from 0 to 315 in. per min. Boring capacity ranges from ¾ to 2½ in. diameter. The spindle pulley runs in ball bearings, and the spindle proper is fed down through the company's rotary bushings, the drive being accomplished by means of a floating key.

Broaching Machines

Broaching Machines, Internal, Horizontal

LaPointe Machine Tool Co., Hudson, Mass. (Vol.78,p.721.) 322.

Horizontal, variable - speed hydraulic broaching machines in eight sizes have capacities ranging from 15,000 to 73,000 lb. The No. 31 machine illustrated has cutting speeds from 0 to 24 ft. per min. and a fast return at 60 ft. per min. Length of the broach is 56 in.; maximum travel of the ram 52 in.

Coolant for the broach is applied by a small pump which is driven from the main drive shaft of the pressure pump. The No. 31 machine has a faceplate 14x16 in., the hole being 5 in. Distance between the ways is 6 in. A 7-hp., 900-r.p.m. motor is recommended. The return speed of the ram can be varied from 20 to 180 ft. per min.

Broaching Machine, Internal, Horizontal

Colonial Broach Co., Detroit, Mich. (Vol.78,p.809.) 382.

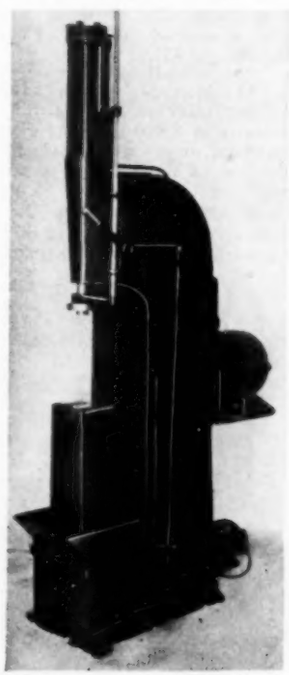
On this special horizontal broaching machine for align-broaching three camshaft holes in a cylinder block, the broach is handled automatically, leaving the operator free to load and unload the work. When inserting the block it is brought up against two temporary stops for centering to facilitate the

entrance of the locating plungers. On the completion of the broaching stroke, an auxiliary oil cylinder pushes the block from the broaching position to the front loading station, allowing the operator to slide the block onto the conveyor line. The machine may be fabricated to any size for any surface or hole broaching operation.

Broaching Machine, Internal, Vertical

Fox Machine Co., Jackson, Mich. (Vol.78,p.585.) 251.

A series of hydraulic forcing and broaching machines being offered includes the 3-ton broaching press illustrated. The frame is of one-piece construction. The base serves as a reservoir for cutting compound and the column as a reservoir for the oil. A Vickers hydraulic feed pump is used. All piping is contained within the frame.

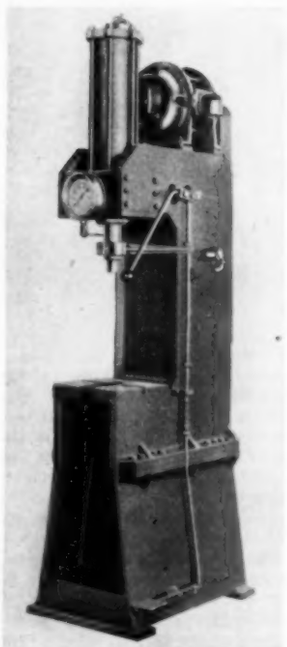


The pan and the table at the front are separate pieces. The table shown can be replaced with others of different heights. At any time during the down stroke the operator can push the hand lever up and produce the up movement of the ram.

Broaching Machine, Internal, Vertical

Logansport Machine Co., Logansport, Ind. (Vol.78,p.783.)

Capacities from ½ to 50 tons are available in this line of forcing and broaching presses. The pump is chain driven by a

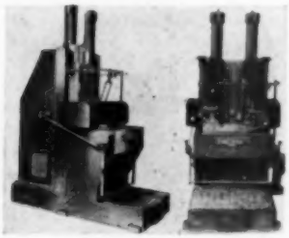


motor mounted on top of the press. Automatic or manual reverse of the ram is provided. When the ram reaches the top position the pump by-passes and does not work against the pressure. A stop rod is arranged on the side of the press for regulating the length of the down travel and position of top stroke.

Broaching Machines, Surface, Vertical

Cincinnati Milling Machine Co., Cincinnati Ohio. (Vol.78, p.622.) 266.

The vertical duplex broaching machines, which make up the "Hydro-Broach" line, are

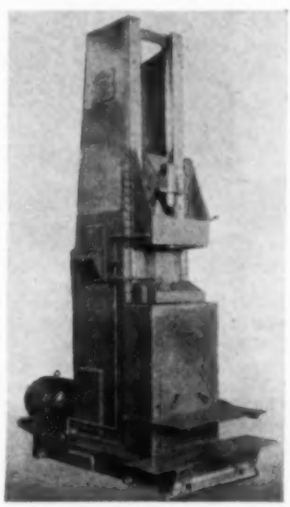


built in three sizes of 2, 5, and 10 tons capacity, each having a normal and extended stroke. Features are: fast cycle, completely hydraulic; continuous operation with automatically indexed work table; simple, rigid construction; long tool life; convenient working height; automatic lubrication; and simplicity of work-holding fixtures. The machines are of the duplex type; one ram goes up while the other comes down. A horizontal work table, indexing around a vertical axis, is mounted in front of the two moving rams. Indexing of the table is controlled by a hydraulic mechanism interlocked with the operation of the vertical rams. Maximum stroke ranges from 36 to 66 in., depending on the model.

Broaching Machine, Internal, Vertical

American Broach & Machine Co., Ann Arbor, Mich. (Vol. 78p.202.) 53.

The capacity of this broaching machine is such as to operate broaches up to 68 in. long. Maximum cutting speed is 18 ft. per min.; return speed, 24

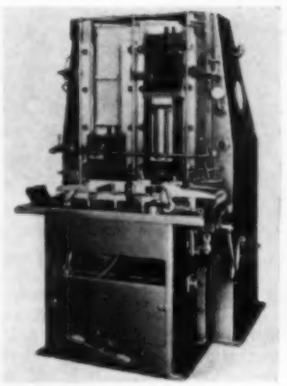


ft. per min. A broad elevator, hydraulically operated, lifts the broach up. An automatic broach-connecting head is furnished so the operator does not handle the broach in any way.

Broaching Machine, Surface, Vertical

Lapointe Machine Tool Co., Hudson, Mass. (Vol.78,p.686.)

This line of vertical hydraulic surface broaching machines, having variable speeds, may be had in a 3-ton size single or double-ram type, a 6-ton capacity, single and double ram type, and 12- and 20-ton capacities in the single-ram type only. The electric motor, hydraulic pump and coolant pump are mounted inside the frame. The broach

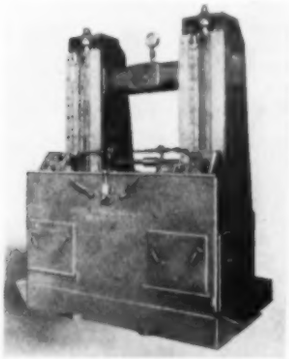


slide is wide to allow for the mounting of different widths and shapes of broaches. It is also thick enough to permit drilling and tapping for mounting broaches.

Broaching Machine, Surface, Vertical

American Broach & Machine Co., Ann Arbor, Mich. (Vol. 78,p.814.) 401.

Hydraulic surface broaching machines with a stroke of 42 in., are available in single or duplex types of 6-, 10- and 15-ton capacities. These machines are fitted with variable-speed controls giving surface cutting feeds up to 30 ft. per min. The broach slide is the cylinder itself, and the slide and cylinder units add to the rigidity and stiffness. Broaches can be adjusted in the event of wear. Where the wear becomes extreme, the broach section can



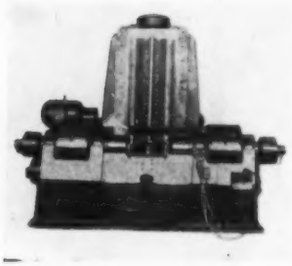
be moved down to the next lower, or roughing, portion.

The machine can be supplied so that both slides will operate simultaneously, or for independent control of each slide, or so that one slide is on the cutting stroke while the other is returning. Dogs provide for any desired stroke. Release valves can be set for any pressure.

Broaching Machine, Surface, Lathe-Type

Wickes Bros., Saginaw, Mich. (Vol.78,p.884.) 429.

A "broaching lathe" has been developed in which the part being machined is revolved on



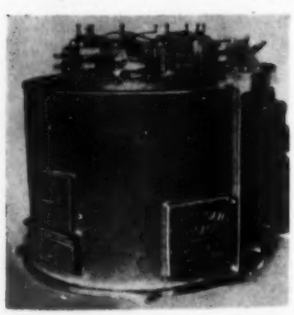
its axis during the broaching operation. The part illustrated in the machine is a cast-alloy crankshaft, and the operations consist of turning, filleting and facing the three main bearings and the pulley diameter adjacent to the front bearing. Approximately 2½ times the number of crankshafts per hour can be obtained as from the most modern double-end drive lathe using the conventional high-speed cutting tools.

Double-end drive is used with herringbone gears mounted on the main spindles. A 20-hp. motor furnishes the main drive and a 10-hp. motor the drive for the feed to the broach slide. A 2½-hp. motor is used for the hydraulic pump.

Broaching Machine, Surface, Rotary

American Broach & Machine Co., Ann Arbor, Mich. (Vol. 78,p.27.) 13.

High productivity with minimum tool expense is offered by this 36-in. rotary, continuous, surface broaching machine. Fixtures on the rotating table carry the work to stationary broaches held in a semi-circular platen. Because of the shear-cut action of the broaches the life of the tools is prolonged. The platen for the broach



holders extends 190 deg. around the column which is itself 4½ ft. in diameter. Broaches of various lengths can be used. Adjustment can be made to all broaches by means of liners. Drive to the worktable is obtained from a hardened worm and worm wheel, hardened helical pinion and gear, and finally through a hardened pinion and large internal gear.

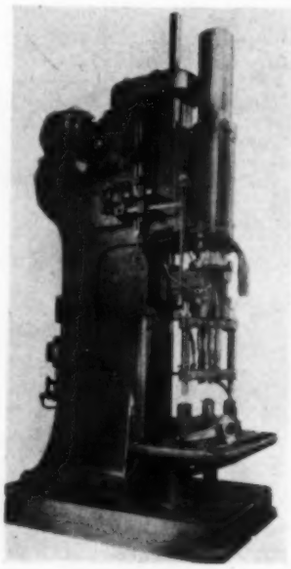
Specifications: height of table from floor, 42 in.; surface speed of work when table revolves at 1 r.p.m., 10 ft. per min.; production, up to 2,000 pieces per hour.

Drilling Machines

Drilling Machine, Vertical, Hydraulic-Feed

Barnes Drill Co., 814 Chestnut St., Rockford, Ill. (Vol.78, p.625.) 270.

The No. H-3½ "Hydram" hydraulic-feed drilling machine has a capacity from 3½ to 4 in. in solid forgings. The machine can make use of any layout of multiple heads. The "Hydram" unit applies hydraulic pressure directly over the center of the multiple head or the cutting



tool. Driving power goes directly to the cutting tool with a minimum of torsional vibration.

Specifications: swing, 32 in.; height of machine overall, 148 in.; distance, face of column to center of table, 16¼ in.; maximum distance from spindle to regular table, 33 in.; maximum distance from spindle to base, 49½ in.; table working surface, 34x21½ in.; floor space, 48x76½ in.; motor, 25 hp.

Drilling Machines, Vertical

Fosdick Machine Tool Co., Cincinnati, Ohio. (Vol.78,p.855.)

The "Economax" upright drilling machine is available in three models as follows: A motorized-spindle type having a box column, a box-column model with the motor on a bracket at the rear of the head, and a round-column model which likewise has the motor mounted on a bracket at the rear. The three sizes are 21, 25 and 30 in.

The speed box has twelve speeds in geometrical progression from 60 to 1,500 r.p.m.

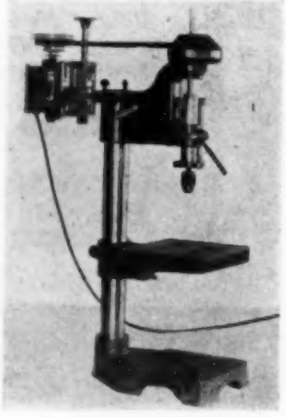
Twelve gears are employed in this transmission unit and are of the selective sliding type. Drive from the motor goes directly through the pinion and gear to the start, stop and reverse, multiple-disk friction clutches.

Nine feeds are supplied from 0.005 to 0.043 in. per rev. of the spindle. Any number of spindle speeds from 1 to 8 can be obtained in a range from 75 to 1,800 r.p.m. One to nine feed changes can be had with a range of 0.005 to 0.043 in. per rev.

Drilling Machines, Sensitive, Bench and Floor-Type

Atlas Press Co., Kalamazoo, Mich. (Vol.78,p.329.) 113.

Four drill presses are being built, three bench models and one floor type. Special attention has been paid to bearing construction. All machines may be driven with either a ¼- or

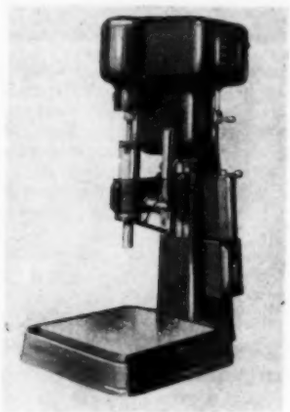


½-hp. motor. The No. 60 drill illustrated has 9 speeds from 600 to 2,500 r.p.m. The height is 40 in., and the maximum distance from the base table to the chuck jaws is 19 in. Maximum distance from the table to the chuck jaws is 13 in.

Drilling Machine, Sensitive, Bench

A. W. Redin & Son Machine Co., 1846 Eighteenth Ave., Rockford, Ill. (Vol.78,p.489.) 183.

This No. 200 sensitive drill with rolling-wedge transmission has eight speeds ranging from 395 to 3,700 r.p.m., in geometri-

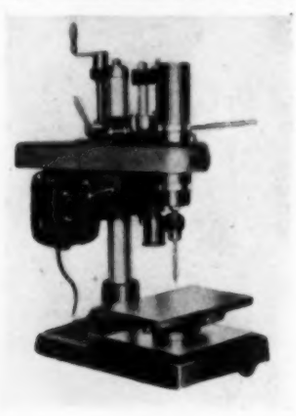


cal progression. The capacity ranges from 0 to ¾ in. in cast iron. Speeds are easily obtained by quick-shift levers. The base has a working surface of 240 sq.in., and has a large bearing on the column.

Drilling Machine, Sensitive, "Maxi-Jr."

Adolph Muehlmatt, Lion Bldg., S.E. Cor. Fifth & Elm Sts., Cincinnati, Ohio. (Vol. 78,p.885.) 431.

The "Maxi-Jr." sensitive drilling machine has a drilling capacity of 0.010 to ¼ in. Four standard drives are obtainable, any one of these drives permitting four spindle speeds. Total speed range covered by these four drives is from 750 to 8,750 r.p.m. Horizontal work capacity

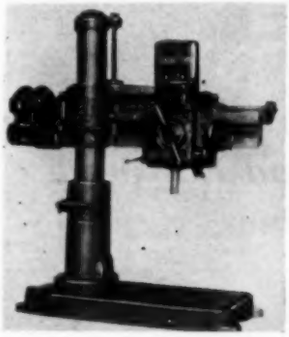


of the "Maxi-Jr." is 10 in.; vertical work capacity, 10 in.; size over-all, 24 in. deep by 20 in. high by 10 in. wide, and the weight is approximately 120 lb. This "Maxi-Jr." machine is readily adapted to group setup. A 2½-in. vertical travel of the chuck spindle is obtained through a 14-position universal ratchet. The 2½-in. feed of the chuck spindle is controlled by adjustable stops.

Drilling Machine, Radial, 3-Ft.

Carlton Machine Tool Co., Cincinnati, Ohio. (Vol.78,p. 488.) 192.

This 3 ft. radial drill with 9-in. column has a low-hung drive to the spindle. Twelve spindle speeds cover the range of 80 to 2,000 r.p.m. or 120 to 3,000 r.p.m. Six changes of feed range from 0.006 to 0.025



in. per revolution of the spindle. Automatic stops control the maximum spindle travel both up and down, and a dial can be set for travel to any predetermined depth. Drive to the spindle is through multiple-disk clutches. Reversal can take place at any speed almost instantaneously.

Drilling and Reaming Machine, Horizontal Four-Way

Defiance Machine Works, Defiance, Ohio. (Vol.78,p.263.)

An extra-heavy, four-way, horizontal drilling and reaming machine with multiple-spindle heads has been built and equipped for drilling and reaming 53 holes in main front tractor frames. Four members carry the slides upon which the multiple-spindle heads and motors are mounted. Box-type construction is used for the fixture, which is equipped with guide bushings for drilling and reaming tools, and with quick-acting screw clamps for locating

and holding the frames in position. Two Oilgear pumps and cylinders are used for feed. Each pump drives two opposed heads and the machine is so arranged that either two or four heads are in work at the same time. Net weight of the machine is 35,000 lb., and floor space occupied is 16 ft. 6 in. by 15 ft. 4 in.

Drilling and Tapping Machine, Cylinder-Block

Greenlee Bros. & Co., Rockford, Ill. (Vol.78,p.549.) 236.

A machine has been developed for drilling and tapping angular holes in straight-eight cylinder blocks. The block enters the machine at the left end, station No. 1. It is transferred manually from one station to the next. Each station has its own independent locating and clamping mechanism as well as independent feed. All

drilling and chamfering operations are performed in the first three stations and tapping operations in the fourth or last station.

In each of the three drilling stations there is one Greenlee standard cam-feed unit which, through racks and pinions, feeds all other drillheads in that station. All drill units are independently adjustable for depth of feed, but the total stroke of each rack-feed head is dependent upon that of the cam-feed unit. The feed in the first three stations is electrically controlled by a pushbutton, operating in conjunction with a solenoid-controlled clutch. In the fourth station all tapping heads are independent of each other with regard to stroke, adjustment and control, each having screw feed and being driven by a reversing motor with a limit switch and pushbutton control.

Drilling Unit, Hydraulic, Square-Ram

W. F. & John Barnes Co., Rockford, Ill. (Vol.78,p.521.) 172.

This unit comprises a base in which is mounted a standard electric motor and a square ram having a 12-in. stroke. The spindle is driven by the motor through pick-off gears. A socket is provided in the spindle-nose for driving a single cutting tool

or a multiple-spindle head bolted to the flange on the end of the ram. By the use of a square section, twisting or turn of the ram is prevented.

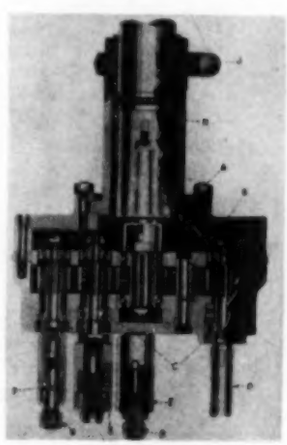
Specifications: Spindle speeds through pick-off gears, with 1200-r.p.m. motor, 92 to 750 r.p.m., with 1800-r.p.m. motor, 138 to 750 r.p.m.; maximum stroke, 12 in.; capacity, any single operation or group of operations requiring 5 hp. or less; weight, including motor, for domestic shipment, 1200 lb. The base of the drill unit measures 34 in. long, 21½ in. wide and 24½ in. high. Minimum extension of the square ram from the base to the spindle nose is 6½ in.; the maximum extension, 18½ in.

Drilling and Tapping Heads, Multiple-Spindle

Buhr Machine Tool Co., Ann Arbor, Mich. (Vol.78,p.785.)

A line of multiple-spindle drilling and tapping heads is now furnished with preloaded ball-bearings to prevent vibration of the spindles and to serve as automatic takeup for wear on the bearings. The improved adapted *H* is interchangeable on all Buhr heads. A steel clamp *J* is used to prevent breakage of the clamping ears when cast integral with the adapter.

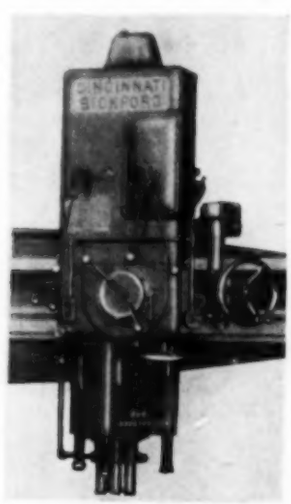
A driver *A* has a pilot that locates the driver in the head before the key enters and can be furnished with a key drive on the taper if desired. Idler gears *B* are the stub-tooth type and run on anti-friction bearings. Spindles *C* have ground tapers or sockets for adjustable collets. Tapers in the spindles are ground and the run-out does not exceed 0.0004 in. Chuck *F* has a double key to obtain more balanced drive.



Drillheads, Radial-Drill, Multiple-Spindle

Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio. (Vol. 78,p.781.) 368.

A self-counterbalancing mounting bracket compensates for the weight of a multiple-spindle drillhead when mounted on the head of a radial drill. The illustration shows a 6-ft. radial drill equipped with a fixed-center, ball-bearing drillhead to carry three 1¼-in. drills, spaced on 2¾ in. centers. Another mounting is of the swivel type to permit rotary adjustment of the drillhead. Either type of drillhead has the spindles in line, but other types of drillheads are equally applicable.

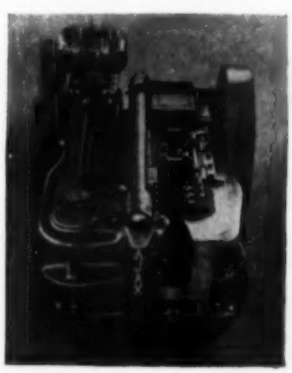


Forging Machines

Forging Machines, Air-Clutch

Ajax Mfg. Co., Cleveland, Ohio. (Vol.78,p.750.) 351.

The line consists of several standard sizes rated from 2 to 7 in. Increased productive capacity is due principally to the employment of an air clutch, (*AM*—Vol. 77, p. 736). This clutch is housed within the machine flywheel, and consists of a series of large disks alternately of alloy cast iron and of



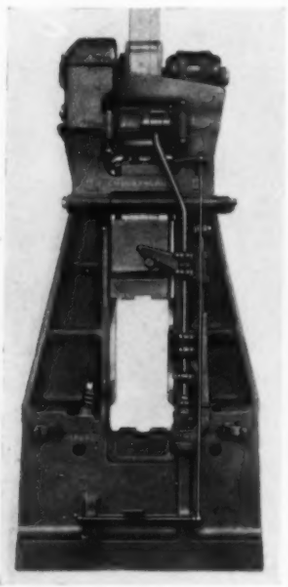
friction-faced steel, which are forced into contact by the direct action of an annular piston behind which compressed air is introduced. This clutch also makes it possible to "inch" machines of all sizes for die setting. It also serves as an accurately adjustable overload safety device through control of torque capacity by adjusting the air pressure.

The frames of these machines are steel castings. Actuation of the die slide is from cams on the crankshaft. The die-slide safety mechanism is of the by-pass toggle type, fully automatic and adjustable. Individual motor drive is provided as standard equipment.

Drop Hammer, Model J

Chambersburg Engineering Co., Chambersburg, Pa. (Vol. 78,p.721.) 334.

This improved board drop hammer, Model J, has frames and anvils made of Cecolloy nickel-molybdenum alloy. The driving gears are heavy pitch with wide face. The motor is rigidly mounted on the head and connected to the driving

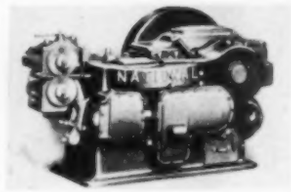


mechanism by a flexible coupling. The anvil has a ratio of 20 to 1 to the falling weight. The frames are non-rocking members with integrally cast guides. A rod giving universal and quicker adjustments replaces the usual notched rack for adjusting the releasing lever position.

Heading Machines, Cold, Solid and Open-Die

National Machinery Co., Tiffin, Ohio. (Vol.78,p.359.) 132.

A line of single- and double-stroke, both solid and open-die, cold headers is available in all sizes to 1 in. capacity. The

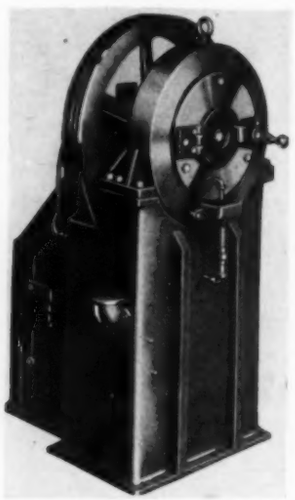


wire is fed to the machine at an angle in order to provide a more square end on the blank. An improved type of cut-off and carry-over is employed. The carry-over mechanism holds the blank rigidly, but it is held open at the time of feeding. On the double-blow machine there is an improved oscillating bolster for transferring the position of the coning and heading tools.

Swaging Machines

Torrington Co., Torrington, Conn. (Vol.78,p.584.) 225.

The features of these machines are a heavy steel head, a short spindle that eliminates whipping; a welded steel body; easily replaceable wearing parts; a positive oil pump that forces oil to the dies and work; Texrope drive, and a motor mounted inside the body of the machine.



Two bench and six floorstand models are built. The capacities range from 9/64 to ⅝ in. solid steel bars.

Swaging Machines

Etna Machine Co., 3400 Maplewood Ave., Toledo, Ohio. (Vol.78,p.628.) 280.

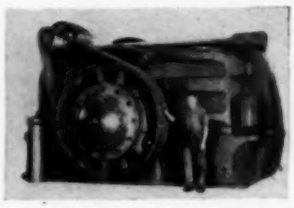
A medium-sized swaging machine is illustrated and is typical of the line. The head is heavily constructed with a heavy steel band shrunk on the outside to counteract the swaging load. The spindle is hardened and ground all over. A complete lubricating system circulates oil through the head. The motor is mounted in the base on an adjustable bracket.

Capacities range from ⅜ to 6 in. in diameter, and use dies from 1 to 18 in. long. They are made in 2-die and 4-die types.

Air-Clutch, Forging Machine

National Machinery Co., Tiffin, Ohio. (Vol.78,p.553.) 240.

A simplified air clutch for forging machine application is



now available. The clutch eliminates the noise caused by the pick-up when the clutch block engages the abutment in the gear. Pressure is applied to the friction disks by a large-diameter air plunger that forces the plates together quickly. Multiple disks of large area are employed to allow low unit pressure and maintain a low temperature.

Compression springs not only expel the used air but separate the friction plates. A "friction-slip relief" is supplied as a separate unit to serve as a safety release for overloads on the machine. A full range of sizes of these air clutches is being built. Low air pressure will operate the clutch.

Gear-Cutting and Finishing Machines

Hobbing Machine, Rotary, Heavy-Duty

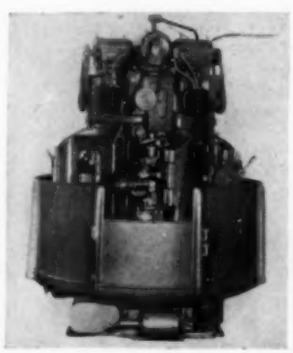
Lees-Bradner Co., Cleveland, Ohio. (Vol.78,p.31.) 17.

This rotary hobbing machine is adaptable to hobbing spline shafts, worm wheels, and spur or helical gears, right or left hand, and with angles up to 45 deg. It will take gears up to 7 in. O.D., 9 in. face and 4 D.P. in steel.

The unit construction permits of four, six or eight hobbing units, each with an individual, constant-speed motor drive and independent hob feed and speed changes. The units mounted on a rotating table which is actuated by a separate motor. Rotation of the table can be timed from one revolution per minute to one revolution in 16 min. through pick-off gears. Another feature is that several different jobs can be handled simultaneously.

The machine is fully automatic. Power input is through a circular collector at the top of the machine. The 3-hp. constant-speed driving motors on the separate hobbing units are automatically controlled. Lubrication is by means of a "cascade" system.

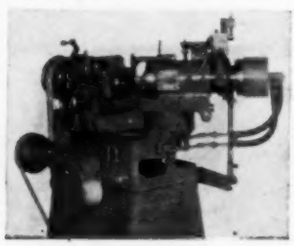
The outside diameter of the base of the four-spindle machine is 8 ft. 3 in. and of the six- and eight-spindle machines it is 9 ft. 4 in. Over-all height of all machines is 115 in.



Chamfering Machine, Gear-Tooth, High-Speed

W. C. Lipe, Inc., Syracuse, N. Y. (Vol.78,p.391.) 136.

This improved gear-tooth chamfering machine is capable of chamfering up to 150 teeth per min. It will chamfer all kinds of gears and pinions. Single- and double-spindle models are built and also a

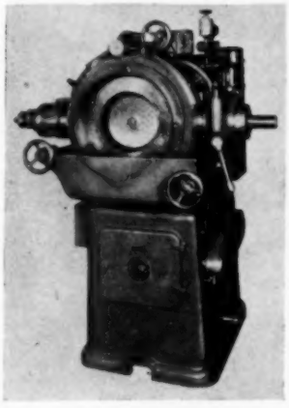


special model for flywheel ring gears. Improved feed and index cams are employed to provide smoother action of the machine and better finish. Precision scales facilitate the setting of various adjustments, and the worm feed carriage has a vernier dial in addition to the scale.

Lapping Machines, Gear, Recess-Type

Fellows Gear Shaper Co., Springfield, Vt. (Vol.78,p.685.)

This machine is adapted to the lapping of both spur and helical gears. For spur gears the use of an internal-gear type lap is recommended and for helical or herringbone gears three external helical gear type laps. On the 7LS machine the



three lap spindles are located at 5 in. center distance and on the 10LS machine this center distance is 10 in.

For helical-gear lapping, the spindle is driven through change gearing, and the three laps are rotated by the action of the work. A friction brake is applied to each of the three lap spindles, and the pressure can be varied. A reciprocating movement is imparted to the work.

Lapping Machine, Gear

Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, Mich. (Vol.78,p.854.) 422.

A gear lapping machine utilizing the "inclined axis" principle has been developed. The axes of the lapping members are inclined to the work piece

in such a manner that the normal line of rolling contact is transferred from one parallel to the axis of the work piece to one which diagonally intersects the conventional pitch line. The machine is automatic in operation and may be had with variable rotating speeds and adjustable reciprocating stroke controlled through an electrical timing device. The "crowned" tooth faces may be produced, as well as "straight" tooth faces because of the slow reciprocating motion.

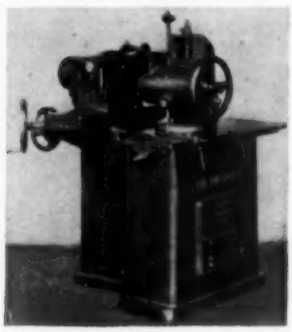
The driven lapping member, through engagement with the work piece which is in turn driven by the driving lapping member, is retarded through braking means. Pressure is thus brought to bear upon opposite flanks of the work piece. The "inclined axial" engagement is suited to engagement of multiple lapping members with cluster gears.

Grinding Machines

Grinder, Face Mill

Kearney & Trecker Corp., Milwaukee, Wis. (Vol.78,p. 457.) 173.

The "Milwaukee" face-mill grinder takes no longer for carbide cutters than was formerly required to sharpen high-speed steel or Stellite cutters. Capacity is for milling cutters up to 16 in. in diameter. The cutter spindle has the No. 50 national standard spindle nose, so that any cutter mounted on the Style "C" arbor can be



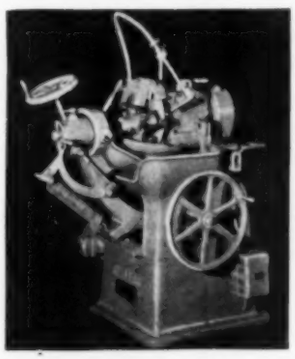
sharpened without removing the arbor. Larger-diameter cutters are bolted onto the spindle nose so that adapters are unnecessary. A dial indicator, reading to half-thousandths, is furnished. The indicator is permanently mounted on the wheel-spindle slide.

The flywheel keeps the abrasive wheel running smoothly. A spindle brake stops the spindle. Floor space, 4x6 ft.; weight, 2,750 lb.

Grinder, Tool, No. 2A

William Sellers & Co., Philadelphia, Pa. (Vol.78,p.138.)

Either cemented-carbide or high-speed steel tools can be ground on the No. 2A tool grinder. A special pre-loaded ball-bearing mounting is now employed in the spindle construction. A V-belt is used for spindle drive. The spindle is mounted in a large bronze sleeve which is oscillated axially by a protected cam revolving at a fixed speed and arranged with a heavy coil spring to keep the



sleeve and cam in positive contact.

Backlash has been eliminated from the feed screw that actuates the in-and-out movement of the chuck. Wheels can be changed quickly for grinding cemented carbide or high-speed steel. The motor is now mounted on the side of the machine and has adjustment for the main drive belt tension.

Shanks up to 1¼x2 in. are taken on the grinder which does all the work necessary to finish to shape from either forged or bar stock cutting tools for lathes, planers, boring mills, and which is also applicable to grinding double-end cutters for boring bars, fly cutters, inserted teeth for heavy saws, round punches, chisels, oil grooving cutters and other tools.

Grinder and Finisher, Cemented-Carbide Tool

Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich. (Vol.78,p.859.)

This grinder and finisher for cemented carbide tools utilizes the new molded diamond wheels. An inbuilt ¾-hp. motor drives the two wheels. Water can be supplied by means of an electrically driven pump at the rear. Tool-support tables are provided at each end of the machine. Graduated adjustments on each table provide a method of maintaining the correct rake and angle for each tool. A large guard covers the spindles and wheels as shown

in phantom. Each end of the guard is left open to allow the operator complete freedom to use the entire length of the table.

Grinder and Lapping Machine, Cemented-Carbide Tool

Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich. (Vol.78,p.427.)

Sharpening of cemented-carbide-tipped tools is the function of this improved grinding and lapping machine. Through the use of hardened and ground plates on the surface of the U-shaped tables at each end of the

machine, greater accuracy can be maintained. These have a horizontal micrometer adjustment. The spindle carries a ring-type grinding wheel at one end and a special cast-iron lapping disk at the other end. Both wheels are 6 in. in diameter.

Lapping Machine, Cemented-Carbide Tool

Porter-Cable Machine Co., Syracuse, N. Y. (Vol.78,p.627.)

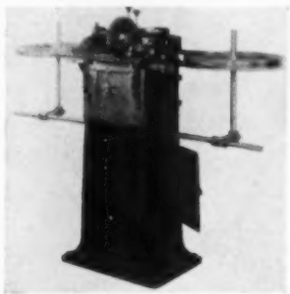
Type D-4 lapping machine has been superseded by the Type D-5 illustrated. The machine is offered for lapping the cutting edge on tungsten-carbide tools. A special ball-bearing vertical motor is mounted inside of the housing. Speeds ob-

tained are 600, 900, 1,200 and 1,800 r.p.m. with an 1,800 r.p.m. motor. The carriage shown is to hold the tool being lapped at the proper angle and with correct pressure. A special Belgian iron disk, 11¼ in. in diameter, is furnished.

Grinder, Saw, Automatic

Wardwell Mfg. Co., 3167 Fulton Road, Cleveland, Ohio. (Vol.78,p.394.) 128.

A fully automatic, combination automatic saw grinder in bench or pedestal types is offered for grinding circular, hack and bandsaws, either for wood or for metal. Three speeds of operation are provided, grinding from 30 to 75

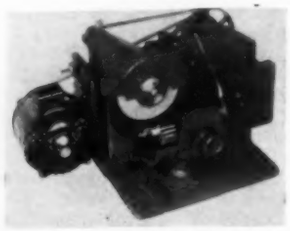


teeth per min. Double feed-pawl fingers ensure continuous advance of the saw. One universal cam permits following any shape of tooth with the grinding wheel. After regrinding, a land or flat may be put on each tooth. The grinding wheel has two speeds. An 8-in. wheel is employed.

Grinder, Saw, Automatic

Wardwell Mfg. Co., 3161 Fulton Rd., Cleveland, Ohio. (Vol.78,p.753.) 348.

A No. 35T automatic saw grinder has been introduced for the sharpening of milling, slitting and screw slotting saws. A gang of saws is lined up on the arbor and ground com-

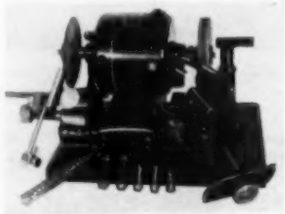


pletely at one setting. The machine automatically indexes the gang, one row of teeth at a time, and the 6x3/16-in. wheel sharpens tooth point and gums the throat in one operation. Capacity is from 2 to 5½ in. in diameter with tooth spacings up to ⅜ in. from point to point. The saw arbor has a capacity for holding saws up to 1¾ in. in thickness.

Grinder, Drill, No. 10

Wells Mfg. Co., P. O. Box 613, Greenfield, Mass. (Vol.78, p.331.) 104.

The drill is sharpened on the right side of the No. 20 machine and the web thinned on the left side. It will take drills from No. 60 to ¼ in. The drill is held in a double-end collet.



In turn, the collet is held in a quill that has two cams, one for throw and one for thrust. Grinding is done by revolving the drill in the quill. A diamond dresser and holder are furnished.

Grinder, Drill

Wm. Sellers & Co., 1600 Hamilton St., Philadelphia, Pa. (Vol.78,p.652.) 273.

The No. 0 50 drill grinder will take drills up to ½ in., and is of the self-contained dry type with direct-connected, built-in, inclosed motor of ⅜ hp., 110 or 220 volts. A chuck holds the drill so that its axis is in correct relation to the wheel. Rotation is less than 180 deg. and the drill is reset so that each lip is in the same position for grinding in order to secure

identical lips and concentricity of the drill point. Rough and finish grinding is done in one operation.

Grinder, Floorstand, High-Speed

Hammond Machinery Builders, Inc., Kalamazoo, Mich. (Vol.78,p.233.) 46.

Two arrangements of the Model 10 WWH high-speed grinder are offered. In the first a single motor up to 15 hp. in size is employed. The two

inner ends of the spindles are coupled together by a combination coupling and V-belt pulley, making it possible to remove the V-belts without removing the spindles from the bearing housings. In the second arrangement the spindles are independently driven.

Grinder, Bench

H. C. Rewoldt Co., 38 Piquette St., Detroit, Mich. (Vol.78,p.298.) 96.

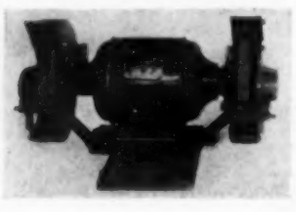
A single-wheel, V-belt driven bench grinder has been placed on the market. This grinder has a wheel 8 in. in diameter by

1 in. face, and is driven by a ¼-hp., 1,750-r.p.m. motor. The spindle speed is 2,800 r.p.m., and the equivalent surface speed of the wheel is 5,500 ft. per min.

Grinder, Bench, 10-In.

Standard Electrical Tool Co., 1938-48 W. 8th St., Cincinnati, Ohio. (Vol.78,p.817.) 383.

A special bench grinder equipped with 10-in. diameter by 1-in. face grinding wheels is

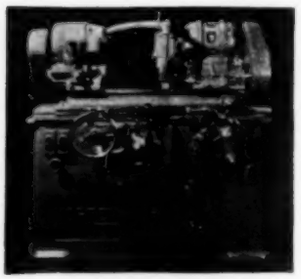


intended for intermittent use and can be furnished with a buffer extension in place of the grinding wheel on the right side.

Grinder, Cylindrical, Type C, 6-In.

Norton Co., Worcester, Mass. (Vol.78,p.856.) 360.

This Type C cylindrical grinder has a nominal swing of 6 in. and is built in two lengths taking 18 or 30 in. between centers. This 6-in. model has a self-contained wheel unit and uses a standard 20-in. wheel. The wheel spindle is driven by V-belts direct from the motor. The headstock is driven by an



adjustable-speed d.c. motor to provide a wide range of work speeds. Power traverse machines are hydraulically propelled and table speeds from 7 to 360 in. per min. are available. Quick-acting latches disconnect the piston, affording a means of operating the table by hand. For plunge-cut operations only, a hand traverse unit is substituted for the power traverse elements. The 30-in. machine weighs 4,700 lb. complete and requires a floor space of 4 ft. 9 in. by 9 ft. 4 in.

Grinder, Cylindrical, Type C, 16-In.

Norton Co., Worcester, Mass. (Vol.78,p.551.) 231.

The grinding wheel spindle of this Type C 16-in. cylindrical grinder is driven by an individual motor mounted directly on the wheel-slide. The headstock is driven from an adjustable-speed d.c. motor mounted on the unit, while a third motor drives the pumps and table traversing mechanisms. The machine will swing 16½ in. over the saddle and mounts either a 30- or 36-in. wheel. It is built in lengths of 36, 47, 72, 96, 120, 144, 168 and 192 in., and is offered either with hydraulic table traverse or mechanical traverse. The grinding wheel unit weighs nearly 3,400 lb. V-belts are used for the drive from the motor to the spindle.

Table speeds for hydraulic traverse machines range from 6 in. per min. to 22 ft. per min. and on mechanical traverse machines from 7½ in. per min., to about 9½ ft. per min. Weight complete with the motors is 13,000 lb. for the 36-in. length, and 26,000 lb. for the 192-in. length.

Grinder, Internal, Manual and Automatic

Heald Machine Co., Worcester, Mass. (Vol.78,p.522.) 194.

The No. 81 small internal grinder can be arranged for manual as well as automatic operation. This machine is of the hydraulically actuated type. When being run as an automatic, the size control can be either by the Size-Matic or Gage-Matic principles.

When using this machine as a hand-operated type the knob *A* is turned clockwise to cut off the oil under pressure to the cross-feed screw. Then the wheel slide can be moved into the work either by using the handwheel *B* or by moving the

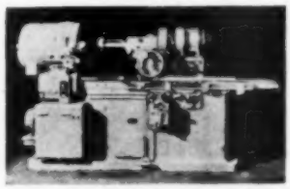
lever *C* to the right. Movement of the lever *C* admits oil under pressure into the mechanism to move the cross-feed screw. The table can be reciprocated either by means of the handwheel *D* or hydraulically. In the latter case the table is reversed automatically by the usual table dogs.

In using the machine with the hand cross feed, lever *E* operates a valve in the control box whereby the table can be run out far enough to allow the truing device to take a pass over the wheel. The chuck or fixture is opened hydraulically when the operator moves the lever *F* to the right.

Grinder, Internal, Airplane-Cylinder

Heald Machine Co., Worcester, Mass. (Vol.78,p.486.) 202.

This internal grinder, known as Style No. 73, is arranged with a hollow workhead for grinding single airplane cylinders, long sleeves and work of similar nature. The general design is similar to other internal grinders built by the Heald company. The base, however, is much heavier. All switches are contained in one terminal box. An inching switch per-



mits the wheel spindle to be jogged.

The table is driven by the usual Heald hydraulic drive. Hole in the spindle is 10 in. in diameter, providing room for all standard single airplane cylinders.

Grinder, Internal, Race, Hydraulic

Landis Tool Co., Waynesboro, Pa. (Vol.78,p.232.) 50.

The 3½-in. hydraulic internal race grinder operates automatically except for loading and unloading. The capacity is such as to grind all the smaller sizes up to and including the 212, 311 and 409 groups. The machine can be used for double-row races and thrust races within the same size range.

As soon as the wheel is

traversed into the grinding position the work starts rotating, the head starts oscillating and the wheel is hydraulically fed at a predetermined roughing rate. When the work is rough ground to within a thousandth of finish size, the feed is automatically cut down to a very fine finishing rate. Coolant can be automatically cut off at this point for a dry finishing operation if desired.

The operator can set the head to oscillate an equal amount either side of center, or the correct amount either side of center for non-symmetrical races. The hydraulic motor and head are turned 90 deg. for grinding thrust races, and the head is capable of oscillating in this position.

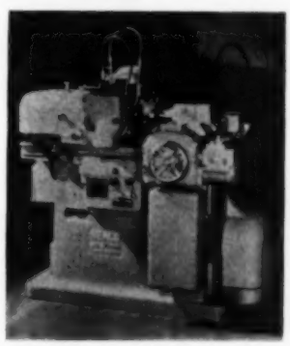
Grinder, Internal, Centerless

Heald Machine Co., Worcester, Mass. (Vol.78,p.198.) 60.

This grinder is entirely automatic in operation and the size of the finished bore is held within very close tolerances by either the "Size-Matic" principle or the "Gage-Matic" principle.

In internal centerless grinding machines it is not possible to pass the work through the machine, but the rotating regulating wheel, together with rotatable work rest, or stationary blade, and pressure rolls, are used. The regulating roll rotates and governs the rate of rotation of the workpiece while the grinding wheel is removing material from the bore. In this case the regulating roll takes the place of the grinding wheel of the external machine while the pressure roll takes the place of the regulating wheel, thereby providing the usual grinding throat.

Specifications: Maximum length of hole that can be ground, 3 in.; maximum outside diameter of work, 3 in.; minimum diameter of hole that



can be ground, not less than ½ in. recommended; maximum included angle of taper (standard Size-Matic only), 30 deg.; table speeds unlimited between 0-30 ft. per min.

When a workpiece is finished the table runs out to loading position, where the work is ejected and a new workpiece is positioned for grinding. The new workpiece first rests on the back surface of the loading arm. As the arm moves in a counter-clockwise direction the workpiece drops onto the regulating roll and is led into position on the rest roll. As the loading arm shaft causes the wise movement a cam on the loading arm shaft causes the pressure roll to be moved away from the workpiece so that it can be ejected from the machine and a new one placed in position.

Grinder, Internal, Precision

Hisey-Wolf Machine Co., Cincinnati, Ohio. (Vol.78,p. 200.) 45.

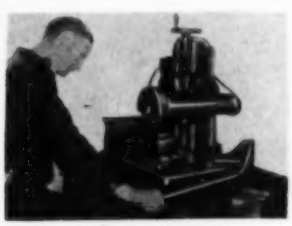
This grinder is provided with a constant-speed motor for uniform grinding and is available

in four sizes: ½, 1, 2 and 3 hp. Design of the unit is such as to permit internal grinding up to the full swing of the lathe or boring mill on which it is used. The dovetail slide with screw feed and handle affords rapid adjustment of the wheel to the center of the work. Direction of rotation of the wheel is reversible through the motor.

Grinder, Surface

Diamond Machine Co., 9 Codding St., Providence, R. I. (Vol. 78,p.719.) 326.

For production and toolroom use, the 8x4x10-in. "Knee Action" surface grinder departs from conventional design. The intermediate table has been eliminated. The "Knee Action" feature consists of a hinged control at the rear of the machine. The micrometer graduated fine feed if utilized after



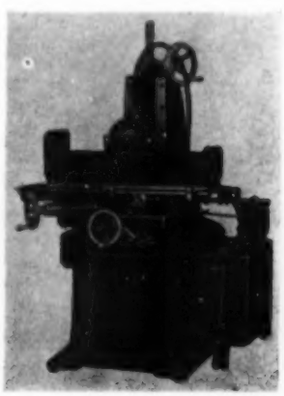
coarse adjustment of the wheel. Both longitudinal and lateral movement of the table are sufficient for the wheel to clear the platen. A rubber-mounted, ½-hp. motor drives the spindle by V-belt. Magnetic chucks 8x4 or 6x4 in. can be furnished. A 7-in. wheel with a ½-in. face is used.

Grinder, Surface, Hydraulic-Feed

Gallmeyer & Livingston Co., Grand Rapids, Mich. (Vol.78, p.687.) 304.

The No. 25 surface grinder has a table surface of 6x18 in. An hydraulic mechanism is mounted inside the base and is driven by a 1-hp., 1,200-r.p.m. motor. Maximum longitudinal table speed is 50 ft. per min. Automatic cross feed or hand cross feed can be had.

A choice of two types of mo-



tor drives is offered. In the first, the motor is mounted directly on the grinding wheel spindle and a 7-in. wheel is used. The second type consists of the motor mounted on an adjustable bracket and driving the spindle through Tex-ropes. In this case an 8-in. wheel is furnished.

Grinder, Surface, Hydraulic-Feed

Gallmeyer & Livingston Co., Grand Rapids, Mich. (Vol.78, p.888.) 434.

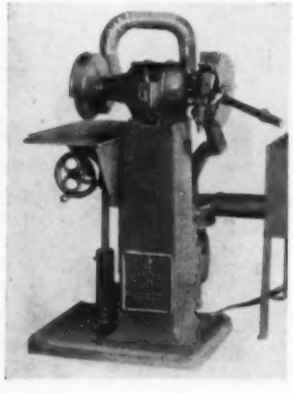
The table of this No. 35 hydraulic feed surface grinder has a working surface of 8x24 in. The grinding wheel has an hydraulic longitudinal movement of 26 in., and a transverse

movement of 9¼ in. A 10x1 in. wheel is standard equipment. One motor drives the hydraulic mechanism and a second is attached to an adjustable bracket for driving the grinding wheel spindle through Tex-ropes. The machine is equipped with a one-shot lubricating system. Weight, 4,000 lb.

Grinder, Surface and Tool

Standard Electrical Tool Co., 1938-48 W. 8th St., Cincinnati, Ohio. (Vol.78,p.811.) 384.

This surface and tool grinder is available in 1- and 2-hp. sizes. These machines are equipped with 10x1- and 12x 1½-in. grinding wheels, respectively. The table measures 11x 21 in. The handwheel spindle is fitted with an adjustable dial

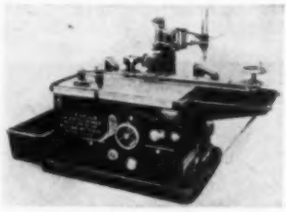


graduated in thousandths. Maximum distance of wheel to table is 12 in. Net weight, 550 lb.

Grinder, Surface, Horizontal

Williams, White & Co., Moline, Ill. (Vol.78,p.652.) 296.

This surface grinder is designed to accommodate a large variety of work without elaborate fixtures. The table of the grinder consists of three parts: namely, the feed table, the circular plate suport which is a stationary member mounted on a column extending through the spindle to the base pan, and



the takeoff table. These tables are ground to a plane. The ring-type wheel is set so that it is flush with the top of the center plate. Depth of cut is regulated by adjusting the height of the feed table relative to the wheel. The work can be passed over the wheel at a uniform rate by means of the mechanical feed that consists of a motor-driven chain with work-driving lugs. The rate at which the chain moves is variable by means of change gears. Water is introduced to the hollow spindle, where it is dispersed through ducts to the work.

Grinder, Surface, Hydraulic

Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio. (Vol.78,p. 816.) 391.

This 14-ft. hydraulic surface grinder can be furnished in table lengths of 10 ft. and longer. The head is arranged to tilt to permit concave grinding. Table drive is accom-

plished by means of a motor-driven hydraulic pump. The volume of oil is controlled by the pump, the pressure remaining constant. The grinding head is counterbalanced.

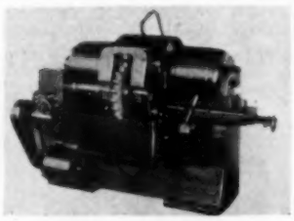
Grinders, Coil-Spring

Hanchett Mfg. Co., Big Rapids, Mich. (Vol.78,p.30.) 2.

Two machines have been developed for grinding the ends of coil springs now being used

in independent wheel suspensions of automobiles. The No. 72 vertical machine grinds the ends of coil springs 10 in. long by 3½ in. in diameter and made out of ¾-in. wire. About ⅛ in. of stock is removed from each end of the spring and the production is 400 springs per hour.

The No. 221 double-spindle horizontal "Badger" grinder is used for grinding both ends of coil springs simultaneously.

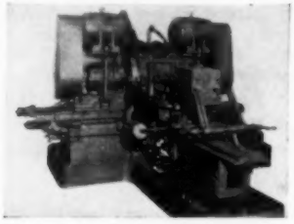


These springs are 2 in. long by 2¼ in. in diameter and are made of ⅞ in. wire. A rotary carrier, comprising a series of notches around the periphery, travels between two 24-in. "Red Anchor" grinding disks. The springs are ground on both ends simultaneously at the rate of 30 per min.

Grinder, Coil-Spring

Gardner Machine Co., Beloit, Wis. (Vol.78,p.137.) 24.

In the two grinders developed for grinding the coil springs used in independent spring suspensions on 1934 automobiles, large-diameter grinding wheels, generally 26 or 30 in., are employed. The machines are provided with an hydraulically operated oscillating knee upon which is mounted an indexing type of fixture. During the

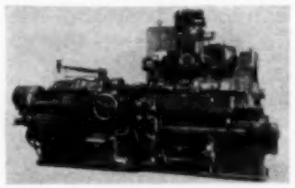


oscillation of the work, the two grinding wheels gradually close in upon it until the springs are ground to a pre-determined length. This infeed on the heads is not a continuous motion, but rather a few thousands with each work oscillation.

Grinder, Crankpin, Hydraulic

Landis Tool Co., Waynesboro, Pa. (Vol.78,p.520). 219.

Type D 16-in. crankpin grinder combines features that make possible grinding all the pins of the crankshaft on one machine with but one handling. Two sizes are offered, namely, 16x32 in. and 16x42 in. Wheel drive is by means of multiple V-belts. Controls are arranged so that the main control lever has a large number of functions. The heads will not rotate with the work unclamped nor will the heads rotate during work table traversal. So



long as the work rest shoes are in their operative positions, the work table cannot be traversed. If for any reason pressure in the hydraulic system drops, the work rotation stops automatically. Hydraulic power is employed to traverse the work table, to feed the grinding wheel, to operate the work clamps and spacing bar plunger, and to move the work rest shoes. Work-carriage guides are flood lubricated continuously with filtered oil. A 36-in. grinding wheel is considered standard, although 42-in. wheel equipment is available.

Grinder, External-Race, Hydraulic

Landis Tool Co., Waynesboro, Pa. (Vol.78,p.583.) 248.

The 5-in. hydraulic external race grinder has capacity to grind all the smaller sizes up to and including the 218, 316 and 414 groups. Although ordinarily used for single-row races, double-row and thrust races may also be ground. The various automatic machine movements are controlled by the

"Landis-Solex" pneumatic sizing device. When the work is rough ground to within 0.001 in. of finished size (which amount is adjustable) the feed is automatically cut down to a fine finishing rate. By means

of the sizing device, raceways may be consistently produced within limits of less than 0.0005 in. Weight: 3,200 lb. without electrical equipment; floor space, 45x60 in.

Grinder, Gear, Special T-Base

Heald Machine Co., Worcester, Mass. (Vol.78,p.458.) 179.

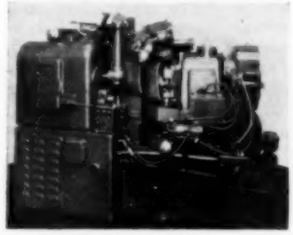
A special T-base grinder is shown for finishing the ends of cluster gears. The machine is arranged with a standard No. 72A internal-grinding-machine hydraulic driving mechanism for the table, and with a standard cross-slide for the wheel-

head. On top of the T-end of the base is a bridge with a swivel adjustment. This bridge carries a headstock and tailstock for centering and holding the gear. The headstock is arranged so that the operator can turn the gear end for end.

Grinder, Gear, Spiral-Bevel and Hypoid

Gleason Works, 1000 University Ave., Rochester, N. Y. (Vol.78,p.550.) 237.

The tooth surfaces are ground with a flaring cup wheel. This wheel is carried from end to end by an oscillating motion to grind the teeth for their full length. Both sides of a tooth space are ground simultaneously. In the grinding operation, the wheel is fed into the gear until the full depth position is reached, then the wheel is



withdrawn and the gear indexed. The wheel dressing operation is manuallly controlled.

The wheel spindle is driven from a motor in the base by a combination V-belt and spiral-bevel gear drive. Chucking and dechucking of the work, the movement of the work head into and out of operating positions, and the clamping and releasing of the workhead in the operating position are controlled from a single manually operated valve.

Grinder, Oil-Groove

Defiance Machine Works, Defiance, Ohio. (Vol.78,p.426.)

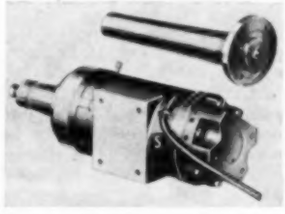
For grinding grooves in hardened pins, shafts and other parts for oiling purposes, a No. 60 grinder has been developed. A swinging arm carries the grinding wheel spindle. Drive

to the spindle is by V-belts from a 5-hp. motor, and three pulleys give speeds of 8,000, 5,800 and 3,900 r.p.m. The swinging arm is counterbalanced to lift the grinding wheel from the work. Vertical movement of the grinding wheel is 6 in. The grinding spindle may be positioned so that its center is either parallel or at right angles to the direction of travel of the table, or it may be set at any intermediate angle. Maximum table movement is 16 in.

Grinder, Angle-Plate

Standard Electrical Tool Co., 1938 W. 8th St., Cincinnati, Ohio. (Vol.78,p.585.) 257.

This combination angle plate grinder is powered by a 3,600-r.p.m. motor. The grinder can be furnished with a solid spindle or with a clutch arrange-

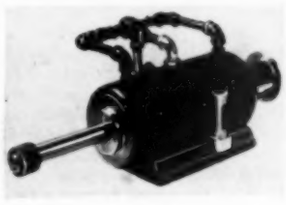


ment so the short extension is interchangeable with the longer extension.

Wheelhead, Water-Cooled

Wicaco Machine Co., Wayne Junction, Philadelphia, Pa. (Vol.78,p.201.) 58.

In this water-cooled wheelhead the oil chamber and bearings are surrounded by a large-size cooling jacket through



which the grinding coolant is continuously pumped. The spindle is constructed to allow the ball bearings to absorb only sufficient heat for efficient operation. Maximum spindle speed ranges to 10,000 r.p.m. on the large head, 15,000 to 18,000 r.p.m. on the medium-size head, and 25,000 r.p.m. on the small head.

Honing Machines

Honing Machine, Horizontal

Barnes Drill Co., Rockford, Ill. (Vol.78,p.815) 378.

This honer handles all bores up to and including 5 in. in iron or steel. One of the features is the method of reciprocating the carriage on which is mounted the spindle, driven from the electric motor on the carriage. A fluid motor is used to give the full hydraulic influence, and yet

to make possible a much shorter length of main bed. Auxiliary means are supplied for short stroking at any point in the spindle travel. Pick-off gears provide for any desired speed, and the volume control gives an infinite range and rate of stroking. One master lever at the operator's station near the middle of the machine controls the starting and stopping of the spindle rotation and also the starting and stopping of the spindle reciprocation.

Honing Machine, Vertical

Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, Mich. (Vol.78,p.688.) 297.

The features of the Model V-300 honing machine are: absence of shock at the ends of the stroke; positively controlled length of stroke; synchronization of the rotary motion with the reciprocating motion; impossibility of stalling the reciprocating motion; coincidental mechanical lift-out of hone; all-geared driving mechanism.

Lathes

Lathe, Bench

South Bend Lathe Works, South Bend, Ind. (Vol.78,p.424.) 156.

A back-geared screw cutting lathe of 9 in. swing is available with countershaft drive or with motor drive. Known as the No. 5 "Workshop" lathe, this machine will do all fundamental machining operations.

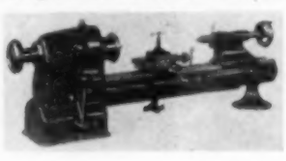
Specifications: spindle speeds for metal, 39 to 630 r.p.m., spindle nose 1⅛ in. in diameter, 10 threads; head- and tail-stock

centers, No. 2 Morse taper; automatic longitudinal feed of carriage, 0.0028 in. per revolution of spindle.

Lathe, Bench

Hardinge Bros., Inc., Elmira, N. Y. (Vol.78,p.552.) 220.

A line of precision motor-driven bench lathes is offered with inclosed-head design and with speed change control levers at the head. The headstock frame is cast in one piece to inclose the three endless V-belts. Speed change levers operate electrical controls to the drive that gives six forward and six

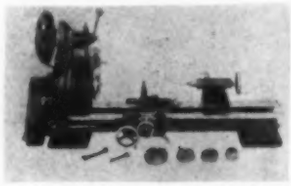


reverse spindle speeds without the use of driving gears, clutches or loose pulleys. Five sizes vary from ½ to 1 in. collet capacity, 7 and 9 in. swing, for bench or cabinet mounting.

Lathe, Bench

Atlas Press Co., Kalamazoo, Mich.. (Vol.78,p.888.) 437.

In this lathe the compound V-belt has been replaced by a set of backgears, thereby increasing the power of the machine. This model permits a 10-in. swing



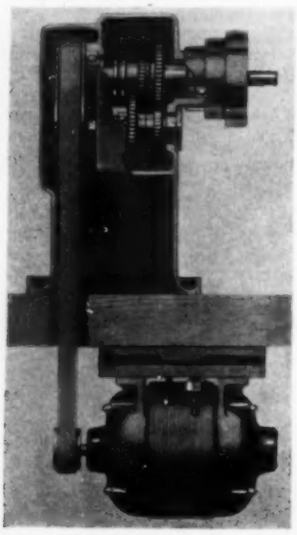
and is 24 in. between centers. Sixteen speeds are obtainable from 28 to 2,075 r.p.m. Automatic, reversible feeds are lever controlled. Change gears are provided for cutting 4 to 72 threads per in.

Gearbox, Bench-Lathe, Motor-Driven

Pratt & Whitney Co., Hartford, Conn. (Vol.78,p.628.) 268.

A complete motor drive unit is now available for use with the Pratt & Whitney bench lathe. The motor is mounted beneath the bench on a hinged platform arranged to tighten the driving belt. Drive is through a 2-speed gearbox to a 3-step cone pulley corresponding to the one in the headstock of the lathe. A ½-hp. motor produces cone pulley speeds of 205 and 820 r.p.m. and six spindle speeds ranging from 145 to 1,400 r.p.m.

When a high-speed drive for the grinding attachment is needed, the top cover of the motor drive unit is replaced with a long bracket and jackshaft arrangement. Jackshaft speeds are 410 and 1,640 r.p.m.



Lathe, Crankshaft, Semi-Automatic

Wickes Bros., Saginaw, Mich. (Vol.78,p.454) 170.

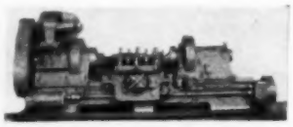
A semi-automatic lathe, 26 in. by 13 ft., has a 12-speed headstock with power feed through a quick-change gearbox. The machine is arranged for motor drive through a multiple V-belt. Automatic stops are provided for both front and back tools.

The crankshaft is mounted on extensible centers and supported on the center main bearing in a roller-type steadyrest. The crank is located longitudinally by a dial indicator against the outside face of the flange. Rear cutting tools are carried on an inverted cross-slide.

Lathe, Crankshaft, Duplex-Type

Wickes Bros., Saginaw, Mich. (Vol.78,p.657) 287.

Large tractor, airplane and diesel crankshafts may be machined by this 38-in., heavy-duty, duplex-type, double-end-drive crankshaft lathe which weighs 22,000 lb. The lathe is provided with front and rear cross-slides, having front and rear tools, and with power cross feed and power longitudinal feed through a



quick-change gearbox. The machine is provided with automatic split feed and automatic diameter stop as well as power rapid cross traverse and power rapid longitudinal traverse. A 25-hp., variable-speed, d.c. motor with automatic speed control is furnished. Steadyrests support the head-end and tail-end pot chucks to eliminate chatter.

Lathe, Crankshaft, Contour-Turning

Wickes Bros., Saginaw, Mich. (Vol.78,p.812.) 379.

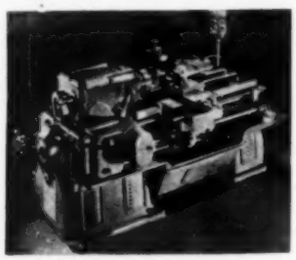
This machine turns simultaneously on the twelve crankarms of a heavy 6-throw, 7-line bearing crankshaft. The crankshaft is supported in and driven by a

heavy pot chuck at each end. The net weight is 62,000 lb. The machine is driven by means of a 30-hp. constant-speed through a speed reducer. Separate motors are used for the hydraulic and coolant pumps.

Lathe, Semi-Automatic, "Magna-Matic"

Monarch Machine Tool Co., Sidney, Ohio. (Vol.78,p.26.) 15.

The "Magna-Matic" semi-automatic lathe is electrically controlled throughout. Magnetic clutches control the carriage, tool-slide feeds and rapid traverse. A magnetic clutch and magnetic brake control the spindle. Limit switches control diameters and lengths of cut. Pick-off gears, both at the front



and rear gearboxes, give the following range of feeds: 0.0046, 0.0064, 0.0087, 0.0115, 0.0219, 0.0296, and 0.0414 in.

A flanged spindle nose is provided. Normal range of spindle speeds is 41 to 610 r.p.m. This range can be stepped up or down either through the speed of the main driving motor or by changing the diameter of the multiple V-belt sheave. The spindle may be safely operated at 1,500 r.p.m.

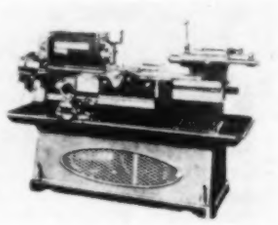
Specifications: Swing diameter over bed ways, 15 in., over carriages, 7 in.; distance between centers with standard bed lengths, 18 in.; additional distances between centers can be furnished in 12 or 18 in. increments to 54 in. maximum; feeds, 0.004 to 0.041 in.; net weight, 4,700 lb.; floor space, 47 x 84 in. for machine taking 18 in. between centers.

Lathe, Semi-Automatic, "Stub," 6-In.

Sundstrand Machine Tool Co., Rockford, Ill. (Vol.78,p.781.) 364.

Semi-automatic and automatic 6-in. Stub lathes are being built, each in three models as follows: Model A—Has a chain drive from motor to speed box; gear drive to spindle, the spindle speed range being from 62 to 663 r.p.m.; Model B—has a chain drive from motor to speed box; gear drive to spindle; spindle speed range from 192 to 1790 r.p.m. Model C—has a flat belt drive direct from motor to spindle, spindle speed range from 1,000 to 3,500 r.p.m.

Besides the speed ranges given



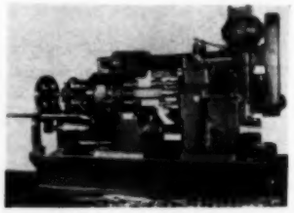
above, specifications are as follows: Capacity between spindle nose and tailcenter, 16¼ in.; swing over bed ways, 17 in. in diameter; swing over front and rear tool-slide ways, 7½ in. diameter. An adjustable control stops the spindle before completion of the rapid return. The tailstock itself is of the quick-acting lever-operated type. A separate motor drives the rapid traverses on the automatic machine.

Screw Machines, Automatic

National Acme Co., Cleveland, Ohio. (Vol.78,p.358.) 109.

The Model R four-spindle automatic screw machine is now made in sizes to 2¼ in. This line is complemented by the Model GA four-spindle automatic which is built in sizes from 2¾ to 3½ in. Accessible tooling and easy replacement of parts are features.

The Model R is arranged to

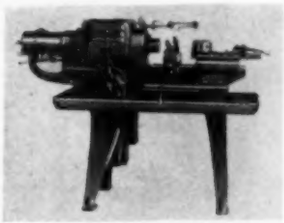


thread in the second or third positions, or both, and in all sizes. The same slide and operating mechanism, in either position, can be used for accelerated reaming or turning operations. The slide for each position is operated by a separate cam to give selective feed. To employ both forming tools and drills at the correct relative surface speeds for each tool, high-speed drilling attachments can be used in all four positions. Constant lubrication of all moving parts and cutting oil are supplied by separate pumps.

Lathe, Turret, Electric, No. 1

Warner & Swasey Co., Cleveland, Ohio. (Vol.78,p.234.) 62.

A high-speed turret lathe, utilizing the motor-on-spindle construction and incorporating an improved bar feed, has been brought out. Four speeds are available in either direction, 600, 1,200, 1,800 and 3,600 r.p.m. Two levers control the spindle through a drum-type controller and



automatic relays. The shorter lever selects the four spindle speeds, while the longer lever stops, starts and reverses the spindle. A large band brake prevents rotation when attaching chucks and loading work.

The improved bar feed holds the bar in a position concentric to the spindle to prevent vibration. The friction feed finger lies immediately behind the collet bore, so that the bar stock can be used up to the last end. Balance at high speed is secured by supporting the bar stock in the spindle by a removable filler tube.

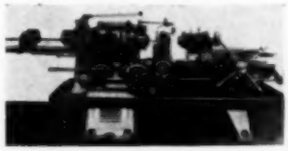
Specifications: swing over bed, 11 in., over cross-slide, 4¼ in.; cross-slide travel, total 4½ in.; automatic chuck capacity, round, ⅜ in., square 5/16 in., hexagon, ¼ in.; bar feed capacity, maximum single-feed stroke, 4 in., maximum bar length, 12 ft.; net weight 1,230 lb.; floor space, machine, 2 ft. x 5 ft. 10 in.

Lathe, Turret, Ram-Type, Universal

Jones & Lamson Machine Co., Springfield, Vt. (Vol.78,p.683.)

Two sizes are: 1¼ in. and 2½ in. bar capacity. The fundamental purpose of these machines is to permit the use of carbide cutting tools. Twelve selective forward and reverse spindle speeds are supplied in two standard ranges, namely, 20 to 1,000 r.p.m. or 40 to 2,000 r.p.m. Either a flange-type motor or a motor mounted in the cabinet leg with drive through multiple V-belts can be supplied.

The carriage apron is equipped with a sliding gear transmission

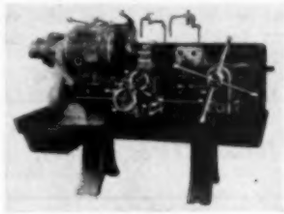


for nine variable longitudinal and cross feeds. Feeds for longitudinal travel range from 0.005 to 0.100 in., and the cross feeds range from 0.0025 to 0.050 in. per revolution of the spindle. A standard taper attachment is bolted to the rear of the carriage. A thread-chasing attachment, installed on the carriage apron, is standard equipment. The machine is fitted with a hexagon turret indexed with a star wheel. The turret is equipped with an automatic clamp ring. The apron for the turret is equipped with nine variable feeds from 0.005 to 0.100 in. per revolution of the spindle.

Lathes, Turret, Universal and Plain

Bardons & Oliver, Cleveland, Ohio. (Vol.78,p.780.) 341.

Universal and plain turret lathes with a bar capacity of 1½ in. and swing of 15¾ in. can be had with either a 12-speed or an 8-speed all-geared head. The 12-speed head provides a speed range from 67 to 1,015 r.p.m. when using a 1,200 r.p.m. motor. The 8-speed head provides a speed range from 75 to 1,015 r.p.m., when a 1,200 r.p.m. motor



is employed. The plain turret lathe is not equipped with power cross and longitudinal feed to the carriage.

In addition to the double multiple-disk clutch conventionally used for start, stop, and reverse, the head embodies a second double multiple-disk clutch through which an instantaneous speed reduction of 2 to 1 may be obtained for threading, reaming and similar operations. Sliding gears furnish all other speed changes.

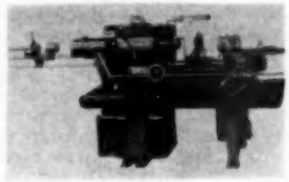
The universal carriage has power longitudinal feed as well as power cross feed, making it possible to do turning and boring as well as facing and forming. Six power feed changes to the hexagon turret are obtained through the saddle apron gearbox independently from the carriage. The automatic chuck and bar feed are both operated by a single lever.

Lathe, Turret

Warner & Swasey Co., Cleveland, Ohio. (Vol.78,p.718.) 337.

This turret lathe with 1-in. bar capacity is equipped with a six-speed, all-geared head. A two-speed motor makes twelve speeds possible with a range from 67 to 1,480 r.p.m. A four-to-one ratio, high-low clutch makes possible the instant shifting to turning, to threading or reaming speeds, or vice versa, without stopping the spindle.

An automatic, circumference binder ring permits the clamping and indexing of the hexagon turret by a rotation of the turnstile. Bars up to ⅞-in. diameter are advanced with a friction



finger lying immediately behind the collet. By using the ratchet feed for the larger bars, it is possible to have a maximum 1-in. capacity. Another feature of this machine is the possibility of arranging the cross-slide as a lever-feed or screw-feed type, or a combination of the two. The six feeds for the hexagon turret range from 0.003 to 0.030 in.

Lathe, Experimental-Type

General Electric Co., Specialty Appliance Sales Dept., Nela Park, Cleveland, Ohio. (Vol.78,p.814.) 369.

The "Workshop" is a combination machine designed to do all sorts of operations in wood and the softer metals. The operations performed are as follows: Saw wood—cross-cut or rip—up to 1¾ in. thick, at any desired angle or bevel; turn wood with a limit of 9-in. diam-

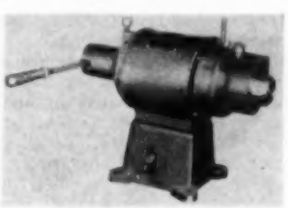
eter for face-plate work; take lengths of 30 in. between centers; readily turn brass and aluminum; sand flat surfaces and contours; scroll work on wood up to 2 in. thick; scroll work on metals including sheet iron; drill both wood and metal; make mortises and tenons.

Lathe, Speed, "Ideal"

Schauer Machine Co., Cincinnati, Ohio. (Vol.78,p.625.)

The "Ideal" speed lathe with hand- or foot-operated collet chuck makes it possible to handle lapping, finishing or polishing operations on small parts. The lathe embodies a totally inclosed motor, automatic brake, ball bearings and collet chuck taking up to 1-in. diameter.

The two-speed motor provides 1,350 and 2,700 r.p.m. The collet chuck can be operated with the motor at rest or running by means of a hand lever or pedal.



Lathe, Speed

Oliver Machinery Co., Grand Rapids, Mich. (Vol.78,p.683.)

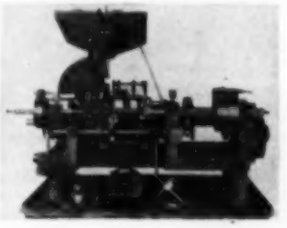
A speed lathe with an adjustable-speed motor in the headstock is intended primarily for pattern shops. This lathe has a range of speed from 600 to

3,600 r.p.m. The motor is of the single-phase, series-compensated type. The entire controlling mechanism is contained in the motor. Speeds are obtained by turning the handwheel.

Pointing, Shaving, Forming and Drilling Machine

H. P. Townsend Mfg. Co., Hartford, Conn. (Vol.78,p.32.)

The No. 3 machine will perform pointing, shaving, forming and drilling operations on either end of previously formed blanks. The hopper feed can be arranged to handle a large variety of forms. Feed fingers carry the



blank from the hopper track down in line with the spindle and move sideways to insert the blank in the jaws.

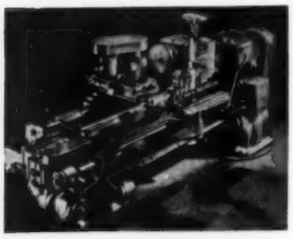
The forming tool and drill operate together or independently. Revolving the work in one direction and the drill in the opposite direction eliminates necessity for high spindle speeds, and the drill does not run out of center. Change gears give a range of sixteen spindle revolutions to one revolution of the camshaft up to 420 revolutions to one revolution of the camshaft.

Lathe Attachment, Cam-Milling

Monarch Machine Tool Co., Sidney, Ohio. (Vol.78,p.166.)

The milling of face cams, single- or double-deck-track

cams, barrel cams and other irregular contour work from a master templet can be undertaken on the Monarch-Keller form turning lathe when it is equipped with a cam-milling attachment. The attachment consists of a sub-headstock that bolts on the bed of the lathe directly in front of the regular headstock. It is driven by silent chain from a sprocket bolted to the flanged spindle nose of the regular headstock.



A complete universal milling fixture fits readily on the carriage of the lathe in place of the regular compound rest.

The milling attachment has a worm-driven spindle giving a 450 to 1 reduction from the spindle speeds provided in the main headstock of the lathe. Drive to the milling spindle is from a 1-hp. a.c. motor. V-belt pulleys having three grooves may be readily interchanged to give six milling spindle speeds from 200 to 1,700 r.p.m. The templets are always made 12 in. long and are laid out in a flat plane. The templet travels its full length to one revolution of the work.

Saddle for Engine Lathes, Multiple-Tool Base

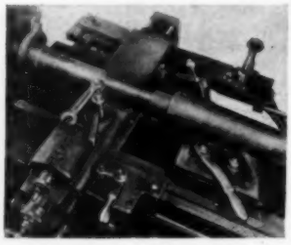
South Bend Lathe Works, South Bend, Ind. (Vol.78,p. 458.) 176.

This saddle, called the multiple-tool base saddle, is designed primarily for mounting special tool-holding blocks for multiple-tool machining work. A slotted table is carried on the saddle, and multiple-tool-holding blocks may be mounted on the table at front and rear. The saddle is connected with the automatic longitudinal feed and has automatic cross feed. Micrometer cross feed stops for front and back tools permit the turning out of accurate work in production. An automatic stop is provided for the automatic longitudinal feed.

Taper Attachment for Lathes

Reed-Prentice Corp., Worcester, Mass. (Vol.78,p.811.) 389.

Capable of turning any included angle up to 120 degrees, this taper attachment for use with the Reed-Prentice line of sliding-gear-head engine lathes is available in 12, 14, 16 and 20 in. sizes. The attachment permits of turning a straight portion of the work to a predetermined point, at which the taper attachment may be engaged and the taper turned to another pre-determined point where it may be disengaged, and the machine resumes straight turning. Determination of the angle of taper is dependent upon both the rate of movement of the slide relative to the carriage travel, and the angularity of the taper bar. Safety stops are provided.

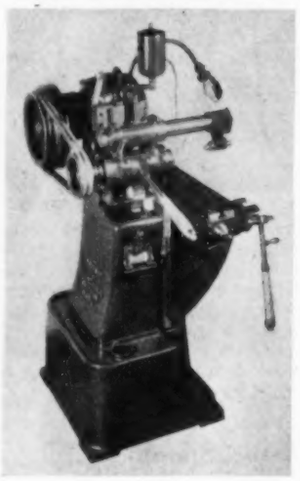


Milling Machines

Milling Machine, Hand

W. H. Nichols, Waltham, Mass. (Vol.78,p.885.) 428.

The "Whitney" hand milling machine is designed for small-part milling. A ¾-hp. motor drives the spindle through a

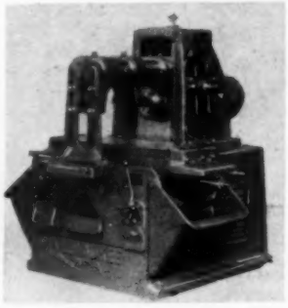


double V-belt. Longitudinal feed, 10 in.; traverse feed, 7 in.; vertical feed, 13½ in.; spindle speeds, 100, 200, 650 and 1,200 r.p.m.; working surface, 4¼x21 in.; weight, 1,000 lb.

Milling Machines, Plain, Automatic

Kearney & Trecker Corp., Milwaukee, Wis. (Vol.78,p. 624.) 269.

"Milwaukee" Simplex and Duplex bed-type milling machines are now provided with complete "two-way" automatic control. With this feature, the table can be operated automatically or manually, or with a combination of both. To obtain complete automatic control, a hydraulic operator has been incorporated in the saddle. Two



plungers at the left and right of the tripping post control the operation of the unit for automatic reversal of the table and rapid return. At the selected point for automatic reversal, a dog depresses the plunger, slightly opening a valve which causes the plunger to jump ahead under hydraulic pressure.

Any one of three feed ranges is obtainable. There are 18 changes within each range: ½ to 20 in. per min.; 1 to 40 in. per min.; 2½ to 100 in. per min. The four speed ranges available are: 20 to 135 r.p.m.; 40 to 270 r.p.m.; 75 to 500 r.p.m.; 150 to 1,000 r.p.m. There are ten changes of speed in each range.

Milling Machine, Plain, Automatic

Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio. (Vol.78,p. 684.) 325.

A small milling machine especially designed for milling typewriter parts, business machine parts, and similar work is being offered. Spindle speeds are available up to 1,800 r.p.m. in eight steps, by means of pick-off gears located in the column. Three series of speeds are available: low, from 40 to 861 r.p.m. furnished as standard; intermediate, furnished on request, and a high series ranging from 246 to 1,800 r.p.m. at

extra cost. A spindle reverse is provided. Sixteen table feeds up to 80 in. per min. are available.

The table has a complete automatic working cycle which includes a sensitive control lever for engagement, a power rapid traverse at 400 in. per min. and dog-controlled intermittent feed and rapid traverse in any combination or direction, depending on the type and number of table dogs employed. Power longitudinal travel is 12 in. with rack feed. Working surface of the table is 8½ in. x 25¾ in.

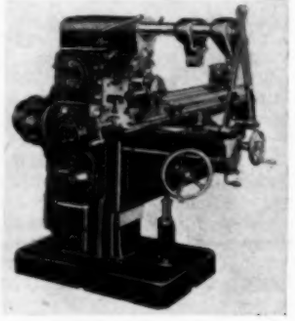
The completely inclosed motor drive uses multiple V-belts, but is readily accessible. There is no saddle and the knee is provided with hand adjustment of 8 in. vertically.

Milling Machine, Universal

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 326.) 116.

The No. 2 universal milling machine is designed for work of the lighter class. Capacity: longitudinal feed, 28 in.; traverse feed, 10 in., and vertical feed, 15 in., all automatic. Universal spiral index centers swing 10 in. in diameter and take 28 in. in length.

The machine is a completely self-contained, motor-driven type. Speeds are arranged in two series, giving 16 speeds from 40 to 1,300 r.p.m. Changes are made by rotating a lever on the side of the column in conjunction with a backgear and a high and low series lever. Single lever control is also provided for the 16 feed changes from ½ to 18¼ in. per min. A



change in the conventional design of column has been made in that the face on which the knee rests is set back approximately 4 in. from the end of the spindle. A universal milling attachment with crane is furnished as an extra. The wide range of the attachment is shown by the speed range of 82 to 2,672 r.p.m. A slotting attachment can be handled by the crane in place of the universal milling attachment. Another feature is the provision for obtaining short leads and fine feeds by the short-lead and feed reducing attachment driven from the table screw.

Milling Machine, Vertical

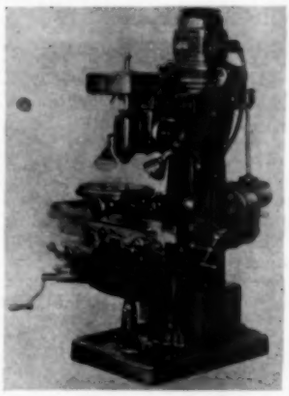
Van Norman Machine Tool Co., Springfield, Mass. (Vol. 78,p.720.) 333.

The cutter head of the No. 12 machine is adjustable not only for horizontal and vertical milling, but also for angular settings over a 90-deg. range. Saddle and table are considerably heavier than former millers of corresponding range. The knee is a box type. Other parts have been stiffened to give greater rigidity than in previous machines of the same size. Standard cutter speeds range from 70 to 1,465 r.p.m. Higher speeds can be obtained if desired.

Milling and Die-Sinking Machine, Vertical

Reed-Prentice Corp., Worcester, Mass. (Vol.78,p.262.) 83.

Vertical motor drive is used on the No. 3V vertical milling and die-sinking machine. Drive is through an endless V-belt. Four-step spindle and motor pulleys provide ten spindle speeds. With a 1,800 r.p.m. motor, the spindle speeds of 600 to 4,000 r.p.m. are available; with a 1,200 r.p.m. motor, 395 to 2,630 r.p.m. Feed is

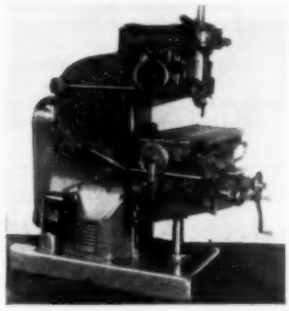


taken directly from the motor through helical gears and a vertical shaft to the gearbox. Six longitudinal feeds are 0.047 to 0.0004 in. per revolution. Specifications: Longitudinal power feed, 21 in.; cross feed, 12 in.; vertical feed of knee, 16½ in.; head travel, 3½ in.; shipping weight of machine, 2,850 lb.

Milling Machine, Vertical, High-Speed

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 687.) 299.

Spindle speeds of this No. 2 high-speed vertical-spindle milling machine are provided in 32 changes from 20 to 1,300 r.p.m. in geometrical progression and in either direction. Changes are made by sliding gears in two series. The speed in use



is indicated on a direct-reading dial. All gears in the high-speed train are made of alloy steel. Feeds are also provided in 32 changes in practically geometrical progression from $\frac{1}{16}$ in. to 62 in. per min. A direct-reading dial indicates the feed engaged. The usual feed for the spindle head is provided with automatic release at any point. The machine can be arranged for belt drive.

Duplicating Machine for Small Dies and Molds

George Gorton Machine Co., Racine, Wis. (Vol.78,p.623.)

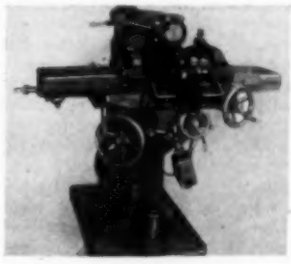
These duplicating machines are manually operated and consist of Gorton vertical milling machines equipped with a tracing arm at the right of the cutter spindle, and a special detachable table mounted on top of the standard milling machine table. With his left hand the operator controls the movement of both milling cutter and tracer spindles. With his right hand the operator moves the duplicator table laterally in any

direction, causing the cutter to mill out the die as the tracer follows the shape of the master. The original can be reproduced within limits of 0.001 in. Spindle speeds, to 12,000 r.p.m., permit the use of cutters as small as 0.025 to 0.030 in. in diameter for fine accurate work.

Profiling and Die-Sinking Attachment

Cleveland Profiling Machine Co., 302 Finance Bldg., 750 Prospect Ave., Cleveland, Ohio. (Vol.78,p.490.) 200.

A profiling and die-sinking attachment for milling machines is being manufactured. The attachment is placed on the overarm. Two arms extend from a hinged shaft. These arms are rigidly connected, their extremities being directly between a follower and a cutting tool so



that there can be no movement of one that is not accurately reproduced by the other. As the table moves back and forth the follower rides the pattern and the cutter reproduces the pattern.

Die-Duplicating Apparatus

Clearing Machine Corp., 6499 W. 65th St., Chicago, Ill. (Vol. 78,p.455.) 174.

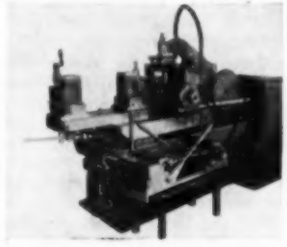
Duplicators that can be attached to ordinary vertical milling machines or horizontal boring machines for die-duplicating

work are being made. These duplicators, which are hydraulically operated, have the advantage that they leave the milling or boring machine intact for regular machine work. Each duplicator consists of an oil storage tank that is equipped with a motor-driven centrifugal pump. When used on a vertical milling machine, the table is actuated by two hydraulic cylinders. The movement of the tracer actuates the control valve for these cylinders. In the case of the horizontal boring machine the movement of the spindle is controlled by the tracer.

Milling Machine, Cam-Feed, No. 30

Producto Machine Co., Bridgeport, Conn. (Vol.78,p. 139.) 21.

The No. 30 Producto-Matic milling machine with hand-indexed table is designed for inexpensive and simple setups on small-quantity production.



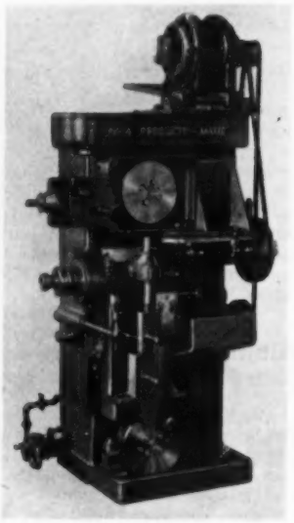
Cutter-slide horizontal movement is 5 in. and the vertical movement is 2 in. The machine has a fixture base made to receive any number of interchangeable work-holding fixtures in two positions, 180 deg. apart. Fixture base indexes by hand. The machine illustrated is equipped with two separate work fixture bases for different types of work. The transmission incorporates a V-type pulley and belt, and nine changes of feeds and speeds are secured. Cutter speeds range from 42 to 600 r.p.m. and the camshaft speeds from 9 to 65 sec. per revolution.

Milling Machine, Cam and Thread, No. 4

Producto Machine Co., Bridgeport, Conn. (Vol.78,p. 296.) 73.

In the No. 4 Producto-Matic thread and cam milling machine all functions are actuated from cams. Dimensions are 30x24

in. for the base by 54 in. high. For thread milling the work slide is moved vertically to bring the work in relation to the cutters. The cutter slide moves in a lateral direction to give the exact lead, which is secured by the movement of the cam. Multiple-point cutters can be used to complete the thread in one revolution of the work spindle. The work spindle is driven by a worm and worm gear. Maximum stroke



is 3 in. The cutter spindle bearing is mounted on the slide and is made to swivel 12 deg. right or left hand to secure the cutting angle required.

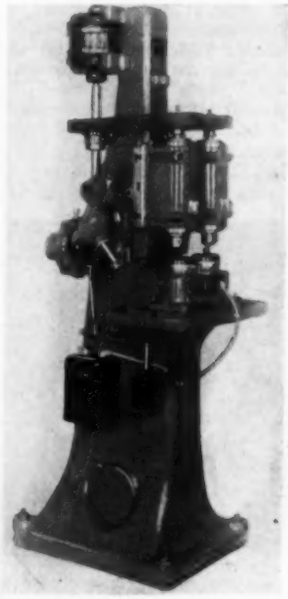
Movement of the cutter slide assembly is actuated by a cam. Maximum lateral movement is 2 in. Thread diameter milled is 4 in. as a maximum. The feed disengages automatically after the camshaft has made one complete revolution.

For producing cams or other profile or contour work, the operation of the cutter and work slides permits the reproduction of any unusual surface from a master cam.

Milling Machine, Cam-Feed

Automatic Machine Co., Bridgeport, Conn. (Vol.78,p. 297.) 98.

A standard milling machine has been adapted to perform a special profile-milling operation. The operation requires the cutting of elongated grooves, tapered in width and depth, duplicated in pairs, and right and left hand. One machine was required to cut four grooves and another machine to cut six grooves in each disk. The high-speed cutters used were of the fish-tail type running at 2,400 r.p.m. The work-holding spindles run right and left hand and are driven by a worm shaft and gears. Stopping of the operation at the end of the last cut is controlled



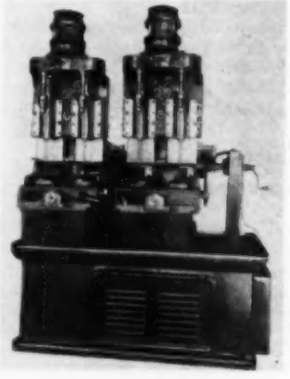
by a limit switch. A cam controls the vertical movement of the cutter slide. On the end of the cam shaft are mounted bevel gears driving through a short angular shaft and another pair of bevels to the work-holding fixture. Production is 60 pairs or 120 disks grooved per hour. The machine is adaptable to work of a similar nature.

Milling Machine, Cam-Feed, Planetary

Producto Machine Co., Bridgeport, Conn.. (Vol.78,p. 858.) 393.

Each column carries two cutter spindles to perform planetary milling operations. Vertical travel of the cutter spindle assembly is made through a drum cam mounted within the housing. Each set of cutter spindles is driven by an independent 1-hp. motor.

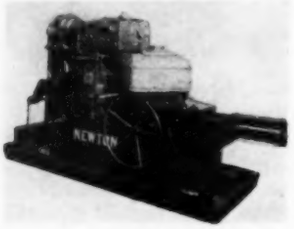
Each work fixture table has two movements. In the first a lateral travel is made to set the work in relation to the cutters for the correct depth of milling. In the second movement of the work fixture makes a complete circular movement to finish the cut. The whole work fixture base can also travel laterally to bring the work and fixture away from the cutters.



Milling Machine, Profile, Special

Consolidated Machine Tool Corp. of America, Rochester, N. Y. (Vol.78,p.782.) 359.

The outside surfaces of square or rectangular castings having rounded corners may be profile milled by a special "Newton" rotary milling machine. The machine has two opposed vertical spindles which carry the milling cutters, the

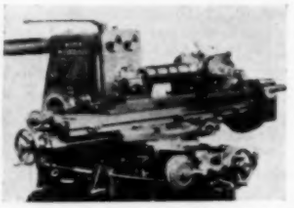


upper spindle being adjustable by an eccentric sleeve to compensate for cutter grinding. The rotary table is equipped with a special fixture for holding the castings. This rotary table is provided with a circular feed and is mounted on a reciprocating slide.

Cam-Milling Attachment

Kearney & Trecker Corp., Milwaukee, Wis. (Vol.78,p. 752.) 342.

The cam-milling slide, in combination with the dividing head and tailstock furnished with the Model K universal milling machines, converts the standard milling machine into a cam miller. The unit consists of a special slide and base, and a roller bracket. Power drive for the head is obtained from



the spiral change gear unit on the end of the table. The slide movement is provided by pressure of the roller following the contour of the master cam. The slide is arranged so the dividing head spindle may be set parallel with, or at right angles to, the machine spindle.

The slide, when used on a No. 2 machine, will accommodate cams up to 10 in. in diameter and 5 in. of travel. Maximum distance between centers is 12 in. The attachment weighs 325 lb.

Index Base

Sundstrand Machine Tool Co., Rockford, Ill. (Vol.78,p. 812.) 397.

The index base with single lever control can be made with the operating lever and clamping segments reversed so that it can be used in pairs of "rights" and "lefts." The single lever operates clamping bolts through two pairs of toggles and a slide to clamp the upper and lower parts of the base together. These index bases are made in six sizes ranging from 12x24 in. to 20x30 in., and the net weights range from 325 to 700 lb.

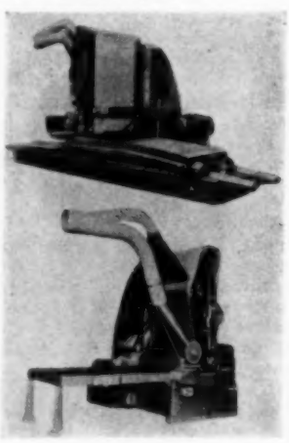
Polishing Machines

Grinders, Sheet, Abrasive-Belt, Nos. 416 and 418

Mattison Machine Works, Rockford, Ill. (Vol.78,p.392.)

The accompanying illustration shows the No. 418 reciprocating-table grinder at the top and the No. 416 roll-feed model at the bottom. The latter machine is designed for superficial and rough grinding. The reciprocating-table model is designed for finer finishing operations. The main arm carrying the abrasive grinding belt, driving and idler rolls is vertically adjustable on the column for different thicknesses of material.

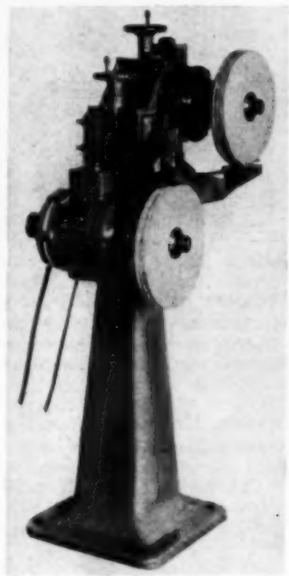
Standard sizes of these machines carry belts up to 50 in. wide. The reciprocating-table model grinds sheets up to 48 in. wide and in any length required. The roll-feed model handles sheets up to 48 in. wide and in any length.



Polishing Machine, Strip

Standard Electrical Tool Co., 1938 W. 8th St., Cincinnati, Ohio. (Vol.78,p.657.) 258.

Both sides of the strip are cleaned and polished in one operation. The unit is for use in connection with electric hardening and tempering furnaces. One machine cleans the scale and another polishes the strip.

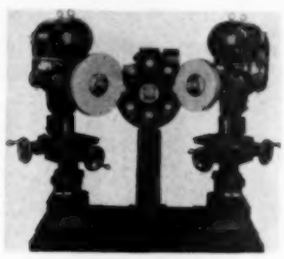


Vertical adjustment is provided to compensate for wheel wear. A guide shoe is located on each wheel.

Polishing and Buffing Machine, Two-Wheel

Acme Mfg. Co., 1645 Howard St., Detroit, Mich. (Vol.78,p. 360.) 131.

An indexing head, eight work holders and two polishing units comprise the machine. The wheel units are adjustable so that contact with the work may be obtained at any desired angle. Indexing is accomplished automatically at the rate of 250 to 1,200 times per hr. Spindles opposite the buffing wheels revolve, while the three lower spindles remain stationary for loading. Work is automatically ejected during indexing. Parts up to 4½ in. in diameter may be handled.

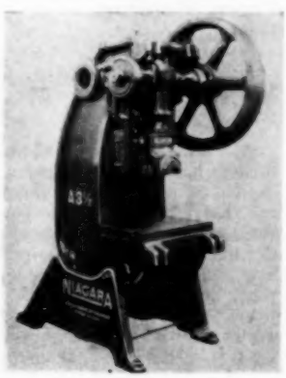


Presses

Press, Inclinable

Niagara Machine & Tool Works, Buffalo, N. Y. (Vol.78, p.627.) 275.

In the No. A-3½ inclined power press the main bearings in the frame are constructed so that the pressure from the crankshaft is transmitted directly to the frame. The slide is guided by two removable gibs provided with take-up for wear. Ways are lubricated by oil cups. The presses are built with an improved pin-type clutch with four engaging points, positive stop to prevent repeating and an indicating arrangement on the brake to show when the proper adjustment and operation are obtained.



Press, Punch, Five-Slide

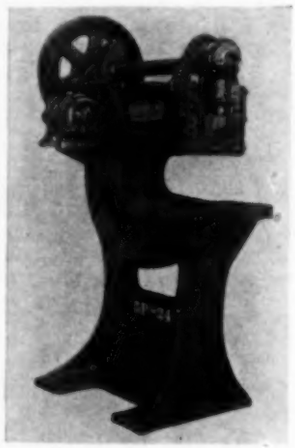
Rockford Iron Works, Rockford, Ill. (Vol.78,p.169.) 32.

Five independent slides operated from a single crankshaft were employed in a press recently built. This type of press may be had in two-, three-, four- or five-slide models of either the flywheel or geared type. The five slides each have adjustment. Three of the slides are built for the conventional type of punch holder, while the remaining two are shorter for special work.

Presses, Punch, High-Speed

Cleveland Punch & Shear Works Co., Cleveland, Ohio. (Vol.78,p.689.) 302.

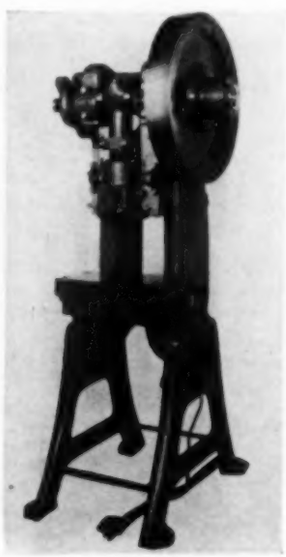
This line of high-speed, deep-throat punch presses has an extra-long adjustment to the slide instead of the conventional 1 in. adjustment. This style of press can be furnished in either the geared or flywheel type and with depth of throat to suit requirements.



Presses, Flywheel and Back-Geared

Federal Press Co., Elkhart, Ind. (Vol.78,p.751.) 354.

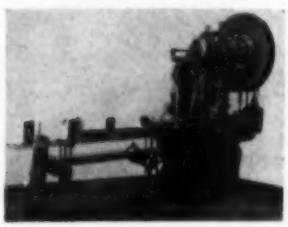
An improved line of presses is being offered equipped as standard with Timken roller bearings in the flywheel of all flywheel-type presses and similar bearings in the back-shaft bearings of all back-geared presses. The roller bearing flywheel does not injure the crankshaft. Much clutch trouble which arises from a loose, wobbly flywheel is eliminated. Other improvements in the line are: An improved clamping device in the pitman for holding the adjustment of the ram adjusting screw; an improved upper knockout bracket for simplifying adjustment; and an improved method of locking the ball cap in place.



Press, Inclinable, Automatic

Schatz Mfg. Co., Poughkeepsie, N. Y. (Vol.78,p.330.) 119.

Variable speeds of 70, 90, 140 and 180 strokes per min. can be obtained from the No. 650 special inclinable press. A vacuum apparatus automatically feeds the strips to the machine. The feeding table is raised mechanically to compensate for the decrease of the height of the strip pile. The strip is gripped by a double-sided precision feed which in this size of machine has a stroke adjustment of 0 to 4 in. and takes strips up to 5½ in. wide. Drive of the machine is through an adjustable, multiple-disk clutch with brake, permitting single or continuous strokes. A reversible multi-speed motor is employed.

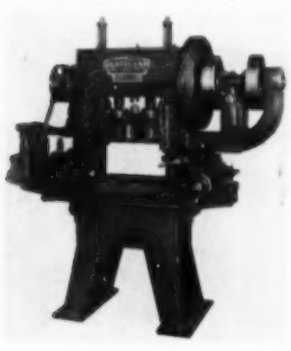


Specifications for machine illustrated: maximum pressure, 45 tons; depth of throat from center to slide, 7¼ in.; distance between slide and bed, stroke up, adjustment up, 12¾ in.; stroke adjustment, ⅛ to 2⅜ in.; area of slide, 8½x7 in.; power required, 5 hp.

Press, Double-Eccentric, High-Speed

Cleveland Punch & Shear Works Co., Cleveland, Ohio. (Vol.78,p.884.) 412.

This line of presses is of the high-speed, double-eccentric, all-welded steel frame type. The model shown can be operated at speeds to 250 r.p.m. It is equipped with a double-roll

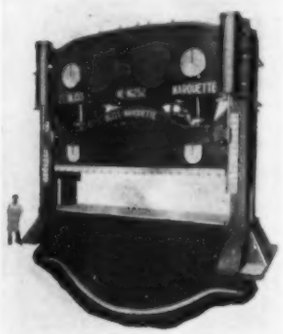


feed and scrap cutter, is arranged for V-belt drive and has a friction clutch and brake. The slide is provided with adjustment for use when setting dies.

Presses, Welded-Steel

E. W. Bliss Co., Toledo, Ohio. (Vol.78,p.554.) 242.

Two large power presses recently built are of steel plate construction fabricated by welding. The press shown is of the four-point type with connections at the four corners of the slide. Shafts are 16 in. in diameter and are loaded in shear. Working capacity of the press is 1,800 tons, plus 300 tons for drawing cushions. Distance

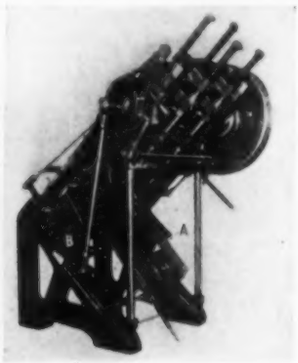


between housings is 252 in., and the bed measures 68 in. front to back, while the slide face measures 241 in. by 52 in. Stroke of the slide is 16 in. and the speed is 7 strokes per min. Weight of the press complete is about 750,000 lb.

Press, Double-Acting

Callahan Can Machine Co., Inc., 80 Richards St., Brooklyn, N. Y. (Vol.78,p.886.) 424.

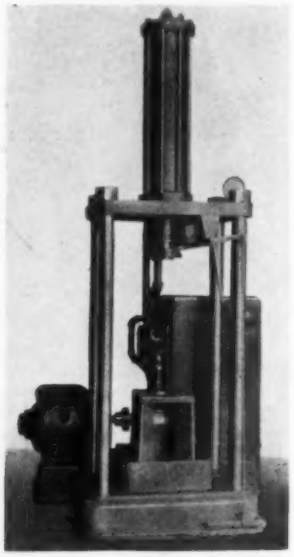
The No. 49 double-acting, multiple-die press is a fully automatic machine. It is equipped with 16 dies and produces 1,520 bottle caps or similar articles per minute. The operator places a batch of tin plate, usually lithographed, in the magazine at *A*. Then one sheet is fed automatically at a time to the dies. The finished work is ejected through chutes, one of which is shown at *B*.



Presses, Utility, Hydraulic

American Broach & Machine Co., Ann Arbor, Mich. (Vol. 78,p.233.) 55.

The 25-ton machine has a downward speed of 18 ft. per min. and a return rate of 22 ft. per min. Maximum daylight between ram and rable is 62 in. and the stroke is 36 in. For the 50-ton press the down speed is 9 ft. per min. and return speed is 12 ft. per min., while

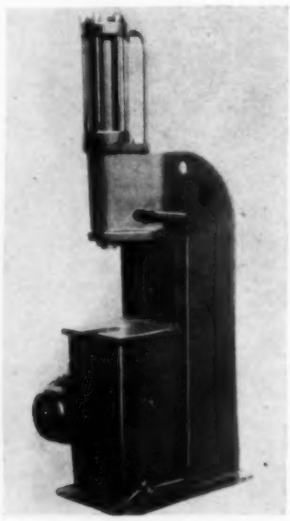


the other specifications are the same as for the 25-ton machine. Hydraulic pressure is generated by the high-pressure pumping system. Food pedal and hand lever controls are fitted and the ram can be inched or given a full stroke by movement of either control.

Press, Hydraulic

Fox Machine Co., Jackson, Mich. (Vol.78,p.331.). 105.

The hydraulic power press illustrated is an 8-ton model with a "C"-type frame. In addi-



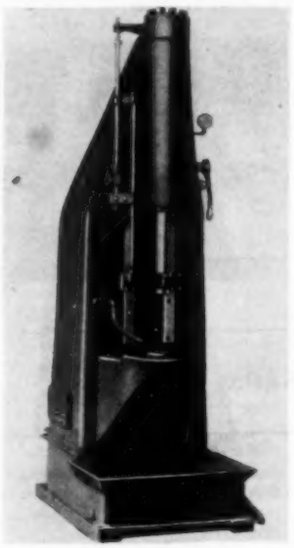
tion to the table height shown, low tables are offered. Frames are made of hot-rolled steel plates, welded and annealed. This method of fabrication makes it possible to furnish presses with special dimensions.

When the ram is in its upper position, which can be at any point on the stroke, the pump delivery is bypassed. A fast traverse can be had, and full tonnage at slow ram speed is available. The reservoir and pump are mounted within the frame.

Presses, Hydraulic

LaPointe Machine Tool Co., Hudson, Mass. (Vol.78,p.752.)

The standard sizes of these hydraulic presses are 6, 12 and 18 tons. Other sizes can be made to customer's specifications. The ram is guided on hardened and ground steel ways



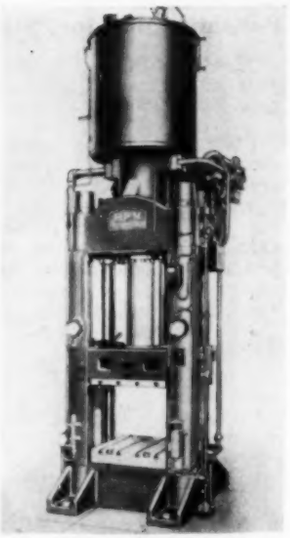
and the sliding member is fitted with replaceable bronze liners. An hydraulic pump is used for operating the main ram and a gear pump for furnishing lubrication.

For the three standard models the stroke is 24 in., the open height is 30 in., the shut height is 6 in., and the size of the platen is 18x36 in. Throat depth is 9 in., maximum speed down is 24 ft. per min., and maximum speed up is 54 ft. per min. Minimum stroke is 2½ in.

Press, Drawing, Long-Stroke

Hydraulic Press Mfg. Co., Mount Gilead, Ohio. (Vol.78, p.688.) 319.

The "Hydro-Power Fastraverse" press is equipped with a synchronized-pressure die cushion. This cushion is actuated by a series of hydraulic cylinders that are hydraulically connected with the same source of pressure that operates the press itself. The press is self-con-

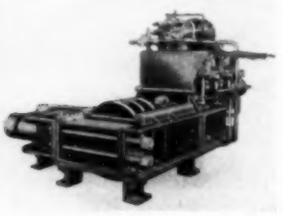


tained having a direct motor drive through a "Hydro-Power" unit mounted on the press head, and it is fitted with a complete system of controls for both press and die cushion.

Press, Baling, Scrap-Metal

Hydraulic Press Mfg. Co., Mount Gilead, Ohio. (Vol.78, p.817.) 377.

A box-type scrap-metal baling press consists of a box built up of ribbed steel castings to take the scrap metal. Pressure is applied to the scrap first from the end and then from the side by platens moving into the box and operated by hydraulic rams. Two rotary, high-speed

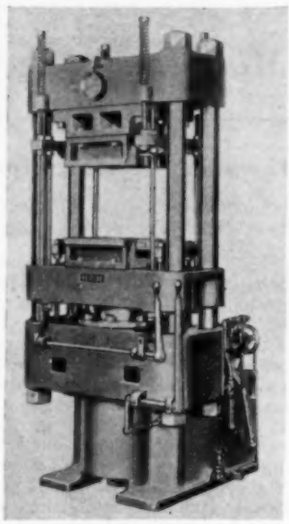


pumps build up the pressure. The first pump delivers a large volume of oil at medium pressure, and the second pump builds the pressure up to the maximum.

Press, Molding, Hydraulic

Hydraulic Press Mfg. Co., Mount Gilead, Ohio. (Vol.78, p.553.) 227.

A line of plastic molding presses has been developed with individual electric drive through a "Dual-Speed" hydro-power transmission. The press cylinder and control valve equipment are inclosed within a pedestal that contains the supply of operating oil. Controls provide adjustable automatic pressure control, regulation of speed of



ram movements, and special control whereby the rate of pressure increase is automatically governed according to a pre-determined adjustment. The last control introduces a new concept in the application of pressures to the molding art, superseding the "stair-step" method of changing pressures. Six standard sizes range from 50 to 300 tons.

Punch, Turret

Wiedemann Machine Co., 1915 Sedgley Ave., Philadelphia, Pa. (Vol.78,p.456.) 178.

The Type R-4 turret punch has a 28-in. throat. This hand-operated machine has a revolving turret for punching holes ⅛ to 1 in. in diameter without changing punches and is complete with twelve punches and

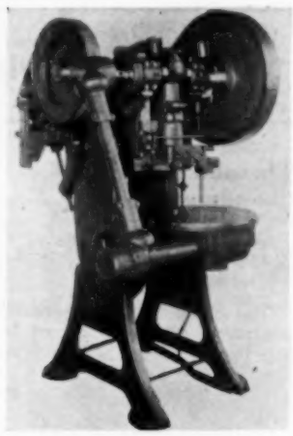
dies. It is capable of punching the following holes: ⅛ to ⅞ in. in mild steel ½ in. thick; ⅛ to ½ in. in mild steel ⅝ in. thick, and ⅛ to 1 in. in mild steel ¼ in. thick. The design is such that the punching of metal 48 in. wide can be accomplished.

Specifications: Clearance between dies and strippers, ⅝ in.; length overall, 46 in.; height, 25 in.; width, 12 in.; weight, 1,500 lb.

Feed, Dial

Federal Press Co., Elkhart, Ind. (Vol.78,p.685.) 315.

The dial has been designed so that tooling jobs can be easily interchanged. The dial plate is independent of the in-



dexing mechanism and can be removed. Any number of dial plates can be used as they are low in cost. The dial feed operates at high speed because of smooth, positive indexing. The dial is skid proof. It is possible to index the dial in one-fourth revolution of the crankshaft, thus allowing longer rest or loading periods between indexing.

Feed, Hitch, 4-in., Dickerman

Producto Machine Co., Bridgeport, Conn. (Vol.78,p. 813.) 394.

A 4-in. model of the Dickerman hitch feed is now available in addition to the 2-in. size. The attachment itself is fitted to the die holder and the operating cam is fitted to the punch

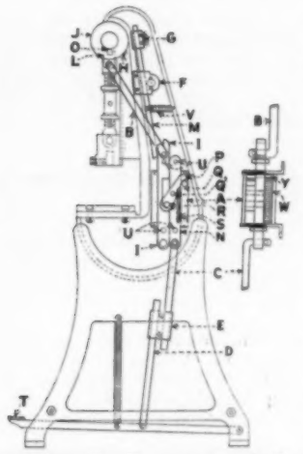
holder. Feed length is 0 to 4 in. with presses having 2 in. stroke or more, and double the stroke with presses of less than 2 in. stroke. This feed will accommodate material up to 8 in. in width. Thicknesses up to ⅜ in. on wide-width material and up to ¼ in. on narrow-width material can be accommodated.

Press, Trip, Non-Repeating

H. & A. Lock Co., 243-53 44th St., Brooklyn, N. Y. (Vol. 78,p.166.) 36.

By pressing the treadle *T*, the member *N* carrying the actuated member *P* is pulled downward. Member *P* swings on stud *Q*. Lower end of the member *P* carries a knife-shaped stud that actuates the slide member *I*, while the upper end of member *P* rides around stud *Q*.

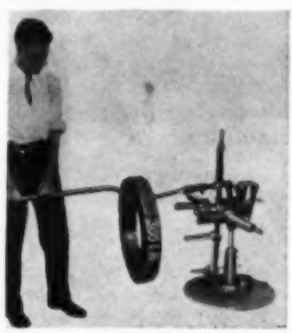
By downward motion of *N*, the slide member *I* is brought down by means of the knife-shaped stud and the motion of



member *P*. By means of the connecting rod *B* the clutch *L* is pulled downward, thereby releasing the clutch-key O, which causes the flywheel to be engaged.

While the slide member *I* is about to be released from the knife-shaped stud, the lower end of the swinging rod *M* is acted upon by spring member *V*, to prevent it from springing upward. This permits the clutch key *O* to engage the flywheel and set the crankshaft of the press in motion.

When the crankshaft *J* is in motion, the slide member *I* is released by means of the lifting cam *H*, acting against block *G*. This releases the clutch cam *L*, returning it to its normal position before the clutch key *O* releases the crankshaft from the



flywheel. Thus, the press cannot repeat its operation until the treadle is relieved from the pressure of the foot and re-tripped.

Reel for Coil Stock, Centering, Automatic

F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill. (Vol.78,p.395.) 137.

The No. 3 automatic centering reel has a capacity for 300 lb. of coil stock. This reel is equipped with automatic centering arms to keep the coil in balance. A loading bar makes it practicable for one man to load the reel. A stock-support arm at the bottom permits running with a loose loop without danger of the stock tangling with the reel arm. Motor drive can be furnished.

Valve for Punch Presses, Air

F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill. (Vol.78,p.655.) 277.

A roller running against a cam that is located on the crankshaft of the press actuates this air valve, releasing a powerful air blast. This cam is set so that the air shuts off when the press stops at the top of the stroke. A flexible metallic-lined hose connects the air valve with the air nozzle. The nozzle is supported by a universal clamp. The valve is adaptable to hand-fed and automatically-fed punch presses.

Shears

Shear With Back Gage, Steel

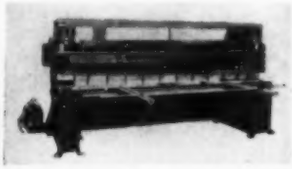
Dreis & Krump Mfg. Co., 74th St. and Loomis Blvd., Chicago, Ill. (Vol.78,p.266.) 82.

High-speed cutting with greater accuracy is secured on the "Chicago" steel power shear by having the back gage operated from the front of the machine. The illustration shows the operating crank of the gage and the dial, which is graduated in inches and sixty-fourths. Both screws are operated in unison, keeping the gage in parallel alignment with the knife at any position. The gage automatically locks at any setting. Gage screws can be disconnected for taper cutting.

Shear, Plate

Beatty Machine & Mfg. Co., Hammond, Ind. (Vol.78,p.859.)

No flywheel is employed in this all-steel totally inclosed plate shear. Control is effected by means of a pushbutton for either single-piece cutting or continuous operation. Vertical stresses are transmitted to the

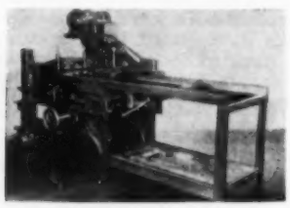


ram and are not carried by the throat. Large or small sheets may be sheared. An adjustable rear squaring gage is provided with a range of 2 in. from the blade to any specified width.

Shear, Blanking, Automatic

R. H. Brown & Co., New Haven, Conn. (Vol.78,p.361.)

A line of automatic metal blanking shears has been developed to take sheets from 0.010 to 0.162 in. thick, from 4 to 36 in. wide and up to 25 ft. long. The blanks cut by these machines range from ½ to 36 in.

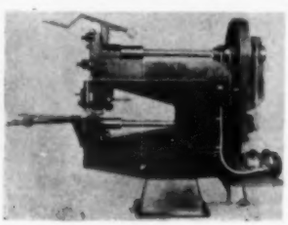


wide. The machine illustrated holds as many as 225 sheets of 0.025 in. stock at one time. The only hand operation required is loading the magazine. Drive is furnished by a 1-hp. motor.

Nibbling Machine, Turret-Head

Gray Machine Co., Box 596, Philadelphia, Pa. (Vol.78,p. 686.) 316.

A larger size turret head nibbling machine has been developed to cut irregular shapes in sheet or plate stock to ¾ in. thick. The throat depth of this machine is 36 in. It can be used either for cutting to a scribed line or reproducing by a master templet. This machine is also

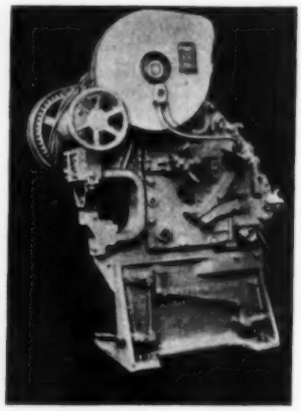


convertible into a roller-die type metal cutter using a square tool. Eccentrics of various throws can be inserted to permit running at the proper speed for the stock being cut.

Shear, Punch and Coper, Portable

Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago, Ill. (Vol.78,p.886.) 410.

This machine has all of the standard features of the cast-steel combination machines on the market for several years. A ball-bearing caster and steel



channel mounting has been arranged so that the machine can be pulled anywhere about the shop. A 50-ft. extension cable provides electrical connection to most any location. The machine can be furnished in various sizes.

Trimming Machine, Stamping

Quickwork Co., St. Marys, Ohio. (Vol.78,p.168.) 34.

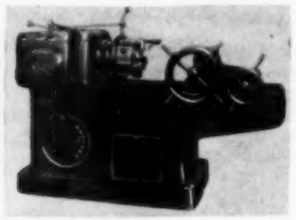
A machine that trims stampings in one plane, such as refrigerator tops, bread pan tops and bottoms, and certain automobile stampings is now manufactured. The cutters revolve continuously. One cutter is moved to and from the other by actuating the lever at the operator's right hand. The machine is driven by a geared-head motor. For large stampings with small radii at the corners, two speeds are provided. The high speed in this case is three times the low speed.

Threading Machines

Threading Machines, "Landmaco"

Landis Machine Co., Inc., Waynesboro, Pa. (Vol.78,p. 329.) 107.

The "Landmaco" threading machine is offered in 2- and 2½-in. sizes. Capacities are respectively ½ to 2 in. and ⅛ to 2½ in. Both are made in the

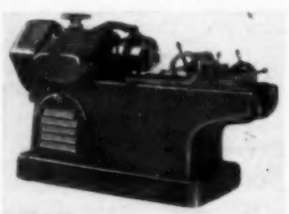


single- and double-head types. Leadscrew attachments can be supplied for both sizes and models. The larger machines are patterned after the smaller types previously marketed and have the same features of de-

Threading Machines, Nos. 11 and 22

Murchey Machine & Tool Co., Detroit, Mich. (Vol.78,p. 327.) 118.

Either the No. 11 or the No. 22 threading machine can be equipped for bolt and machine threading or for pipe threading. The No. 11 has capacity from ¼- to 1-in. machine threads and from ⅛- to ¾-in. pipe threads. It is built in single- or double-head types, and either type can be furnished in two different lengths of bed. The No. 22, built only in the two-spindle model, is designed for ¼- to 2-in. pipe threads and from ⅛- to



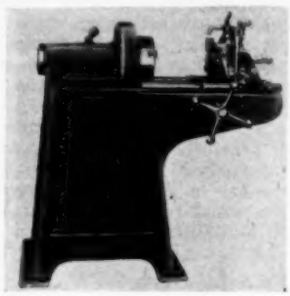
2-in. machine and bolt threads.

Speeds are adjustable between 72 and 386 r.p.m. and can be increased while the motor is running. Opening and closing of the dieheads is accomplished by the forward or back movement of the carriage. Dieheads used on machines to thread pipe are of the receding type with inside trip and are arranged to ream and chamfer the pipe while threading. The carriages are operated by handwheel or lever through a rack and pinion, which at the same time closes the diehead.

Threading-Machine, Pipe

Landis Machine Co., Waynesboro, Pa. (Vol.78,p.654.) 292.

The "Little Landis" combination pipe- and bolt-threading machine is of the lathe type in which the work is revolved. It is designed to thread, ream and cut off pipe and thread bolts and rods. The Landis diehead tangential chasers are employed. The machine is made in the motor-driven type only, employing a 1-hp. motor and industrial-type control. The motor is connected to the geared headstock by means of a silent chain



drive. A scroll chuck of three-jaw universal type is employed. Two dieheads, having combined capacity of ¼ in. to 2 in., are furnished. By applying bolt chaser holders, the 2-in. head can be used for threading bolts from ⅜ to 1¼ in.

Tapping Machine, Bench, Horizontal

Langelier Mfg. Co., Providence, R. I. (Vol.78,p.263.) 78.

This bench tapping machine is designed for small light tapping operations. The spindle is equipped with a No. 1 Jacobs chuck and has a capacity of ⅞

in. in sheet metal. Drive is by means of open and crossed belts through a friction clutch. Distance from the bed to the center of the spindle is 3¼ in., and the bench space required is 22x4 in.

Tapping Machine, Vertical, High-Speed

R. G. Haskins Co., 4636 W. Fulton St., Chicago, Ill. (Vol. 78,p.266.) 76.

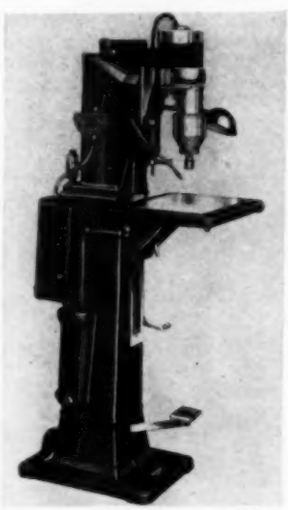
A tapping machine capable of speeds up to 3,000 r.p.m. is available. The motor in the tapping head is of the repulsion-induction type. Two high speeds are provided. There is

no float in the tap spindle and instant reverse may be had at double the tapping speed. Five collets are furnished as standard. The table is adjustable for different heights of work. Stops are arranged for vertical travel of the tapping head, the maximum travel being 3 in. Tapping capacity of the machine is ¼ in. in non-ferrous metals and 7/16 in. in steel.

Tapping Machine, Vertical, High-Speed

R. G. Haskins Co., 4636 W. Fulton St., Chicago, Ill. (Vol. 78,p.689.) 317.

The range of this tapper, known as the No. 2 is No. 10 taps up to and including 7/16 in. in steel, ⅝ in. in cast iron and 7/16 in. in brass and other non-ferrous metals. A ½-hp. motor furnishes power. Two change gears are furnished, giving speeds of 1,100 and 1,750 r.p.m. Reverse of the tap is automatically obtained when the pressure on the pedal is released.



Tapping Machine, Multi-Spindle

Globe Tapping Machine Co., 751 Central Ave., Bridgeport, Conn. (Vol.78,p.719.) 329.

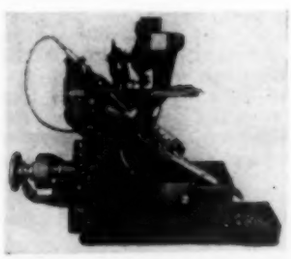
The Type A automatic hopper-feed machine has a production range from 120 to 180 pieces per minute of single-hole parts, either tapped, drilled, countersunk, threaded or hollow milled. Ordinary commercial

straight-shank, high-speed taps are used. Several types and sizes of parts can be handled by changing the chutes and an adapter ring in the hoppers, and relocating the spindles which are adjustable. The drive is from a 2-hp. motor mounted on a tilting plate in the rear base.

Tapping Machine, Nut, Automatic

Acme Pattern & Machine Co., 1559 Niagara St., Buffalo, N. Y. (Vol.78,p.785.) 357.

A fully automatic precision nut tapping machine having a hopper feed of the rotary disk type and employing a 15-in. straight shank tap, is capable of producing threads of all classes of fit. It will tap nuts from ⅜-24 to ⅞-14 hexagon, ⅜-16 to ¾-10 hexagon, or ⅜-16 to ¾-10 square. All nuts are tapped in a direct line, and each nut while being tapped does not have to force a row of nuts ahead of it. The tapping spindle is set at a downward 45 deg. angle and uses gravity to expel the tapped nut.



Tapping Machine, Nut

National Machinery Co., Tiffin, Ohio. (Vol.78,p.423.) 154.

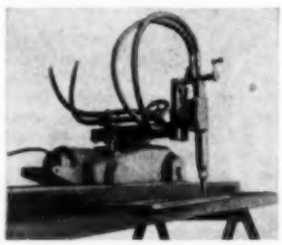
A line of precision nut tapping machines has been announced for commercial tapping of Class 3 and 4 fit nuts. A special type of hook tap is employed to keep the tap positioned accurately for close-limit tapping. A hopper turns the nuts so that they are presented to the tap with the bottom face against the injector. These machines are built in a full range of sizes from ¼ to 1 in., both hexagon and square, and they also can be arranged for tapping Dardelet nuts.

Welding and Cutting Machines

Cutting Machine, Flame, "Oxweld"

Linde Air Products Co., 30 E. 42nd St., New York, N. Y. (Vo.78,p.782.) 362.

Straight-line cutting, straight bevel cutting, plate edge preparation, circle cutting of diameters up to 100 in., and the cutting of irregular shapes may be accomplished by the "Monitor" CM-8 cutting machine. The machine is easily portable. One blowpipe, the Oxweld C-7,

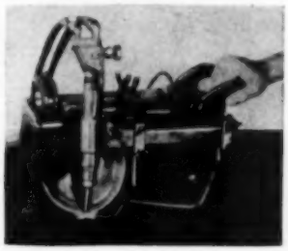


permits cuts up to 12 in. The Oxweld C-22 blowpipe may be substituted for heavier cutting. Provision is made for the use of two blowpipes simultaneously. The blowpipe holders may be swung into any horizontal position over a working arc of 250 deg. Protractor scales gage the tilting of the blowpipes.

Flame Cutting Machine

Air Reduction Sales Co., 30 E. 42nd St., New York, N. Y. (Vol.78,p.720.) 330.

A small motor-propelled oxy-acetylene machine has been developed for cutting steel plates and slabs up to 2 in. in thickness. Known as the No. 1 Airco-DB Tractograph, this

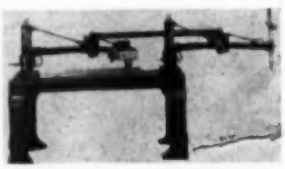


machine measures 7½x8½x16 in. and weighs only 48 lb. and provides means for cutting steel plates into shape having straight, circular or irregular outlines and extending over practically unlimited areas. It is guided by hand along the desired contour. In addition, the Tractograph will cut beveled as well as perpendicular edges.

Cutting Machines, Flame, Pantograph-Type

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. (Vol. 78,p.362.) 130.

To a line of pantograph-type gas cutting machines have been added the following units: "Airco-DB" No. 7 "Oxygraph" and "Airco-DB" No. 1 "Travograph." The No. 7 Oxygraph, Fig. 1, has no tracer bar, the tracer being attached to the end of one pantograph arm and the cutting torch to the end of the other arm. This machine is designed for single-torch operation only. The tracing table for holding the full-scale drawing is part of the machine. The fourth side of the parallelo-



gram is removed at the rear, thus permitting the covering of a maximum cutting area.

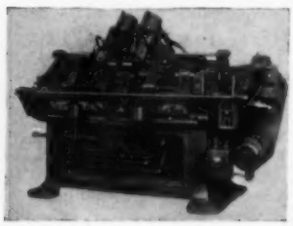
In the case of the No. 1 Travograph, the pantograph assembly is mounted on a carrier that travels on rails to extend the cutting area. As many as six cutting torches may be mounted for multiple cutting. The No. 1 Travograph can also be operated with either manually controlled or a magnetic tracer.

The cutting area or range of the No. 7 Oxygraph is a 30 in. square or a 36 diameter circle, while that of the No. 1 Travograph is a rectangle 4½ ft. in width and 11 ft. in length, with one 16-ft. section, or any length with additional rail sections.

Welding Machine, Butt, Automatic

Taylor-Winfield Corp., Warren, Ohio. (Vol.78,p.424.) 165.

The No. B-8, 45-deg. butt welder has been developed for use on special alloy steels such as employed in motor valves and tappets. The features of this unit are an infinitely variable speed drive arrangement for the correct welding speed, an infinitely adjustable welding

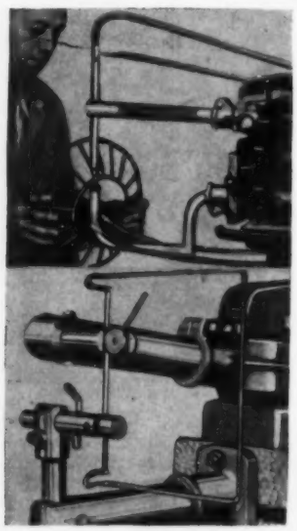


stroke to provide the correct amount of burnoff and upset, a quickly set and readily adjustable back-up stop to take up any variation in the length of the part, tie-rods aligned with the weld to eliminate distortion, and a bed plate tipped at an angle of 45 deg. for convenience of the operator. The welder illustrated has welding capacity up to ¾ in. rounds.

Welding Machine, Butt, Wire

Eisler Engineering Co., Inc., 740-770 South 13th St., Newark, N. J. (Vol.78,p.491.) 212.

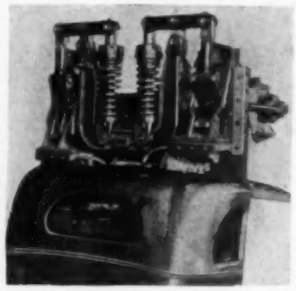
These welders have been designed especially for butt welding of wire and are used for manufacturing various novelties of brass, bronze, copper from round or square rod and wire. When furnished mounted on movable pedestals, they may be easily transported about the plant. Special annealing and quick pressure-adjustment devices enhance the operating efficiency.



Welding Machine, Projection, Special

Thomson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass. (Vol.78,p.394.) 141.

A two-head, double-stroke, projection welding press was recently developed for the purpose of welding two gusset plates to the top rail and back panel of an automobile body. Sixteen projection welds were made with each stroke. The

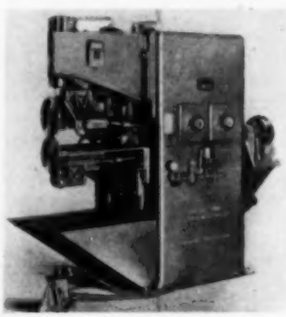


press utilizes a powerful toggle action and is equipped with quick-changing dies faced with Elkonite inserts.

Welding Machine, Seam

Thomson-Gibb Electric Welding Co., Bay City, Mich. (Vol. 78,p.360.) 44.

A "1000 Series" seam welder has been developed for production of straight or circular seam welds in ferrous metals, corrosion-resistant steels and, with slight modifications, in non-ferrous metals. The welder will handle work from 10½ in.

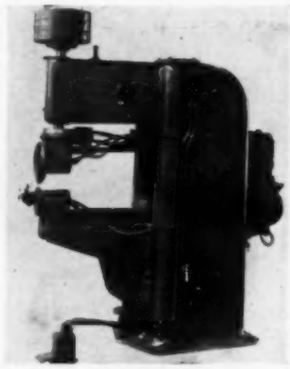


in diameter by 12 in. in length to 40 in. in diameter by 45 in. in length, and at welding speeds varying from 2 to 15 ft. per min., and with welding pressures from 650 to 1,400 lb. Transformer capacities range from 100 to 250 kva.

Welding Machine, Seam, Universal

Taylor-Winfield Corp., Warren, Ohio. (Vol.78,p.555.) 229.

The "SW-100 Series" universal air-operated seam welder is arranged so that the rolls can be turned either to the right or to the left of the knee for longitudinal as well as cross welding. The upper roll is driven

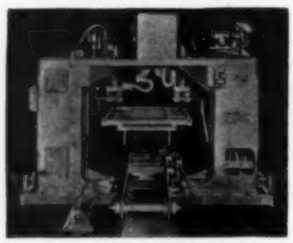


positively through spiral gears from a gear reduction unit. Welding speeds range from 45 to 130 in. per min. Pressure on the upper roll may be varied and vertical adjustment is from ¼ to 2 in. The lower roll support has a vertical adjustment of 4 in.

Welder, Seam, Dual-Roll

Thomson-Gibb Electric Welding Co., Lynn, Mass. (Vol.78, p.584.) 252.

A dual roll seam welder has been built to weld the back panels of refrigerators to the sides and front which are made from a single sheet of steel.

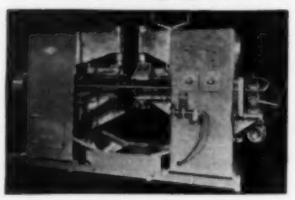


Both sides are welded at the same time. Forward and return motion to the platen is controlled by a reversible switch. Welding pressure is supplied by two air cylinders controlled by a single foot-operated valve.

Welding Machine, Seam

Thomson-Gibb Electric Welding Co., Lynn, Mass. (Vol.78, p.656.) 288.

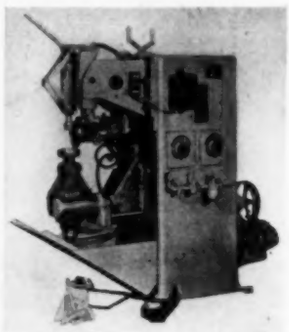
This machine welds a forging to each end of a tubular shock absorber housing at the same time. Each of the two units that comprise the complete welder makes two welds in series. Actually the machine makes four seam welds simultaneously. The machine is equipped with special work-holding and aligning fixtures to assure accuracy, and with a special quick-acting tailstock for speeding up the handling of the work. Both the work and welding wheels are cooled by a flood cooling system.



Welding Machine, Seam, Special

Thomson-Gibb Electric Welding Co., Lynn, Mass. (Vol.78, p.888.). 417.

A special seam welder has been designed for assembling the compression headers in electric refrigerators. The header is a ball-shaped unit made up of two half spheres with outwardly turned flanges. The



bottom half of the header is set in place in the lower welding roll which is shaped to hold it. The top half of the sphere is then placed under the upper or idler roll and adjusted by a hand toggle work locator. A special worm drive operates the lower roll and a Reeves Vari-Speed pulley controls the welding speed within a range of 1½ to 4½ ft. per min.

Welding Machines, Special, Automatic

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.460.) 186.

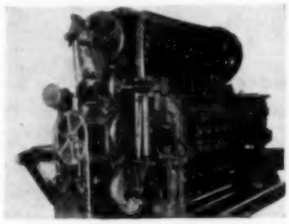
Automatic machines for welding automobile muffler assemblies by the shielded carbon arc process are announced. The equipment used consists of two machines, one a vertical type, as shown, and the other a horizontal model. With the welder, illustrated, the operator places the muffler in position, lowers the welding head, edge welds

the tubes in place, raises the head and turns the muffler upside down where he welds the pipes on the other end. The complete operation requires 30.5 sec. A second machine lap welds the muffler tubes for connection to the exhaust pipe.

Welding Machine for Road-Reinforcing Mats, Automatic

Thomson-Gibb Electric Welding Co., Bay City Mich. (Vol. 78,p.266.) 85.

An automatic welding machine has been designed to produce welded mats for road-reinforcing and also other steel fabrics. The machine handles rods or wires of any size from ½ in. down. Longitudinal and cross wires are fed directly from reels except when the

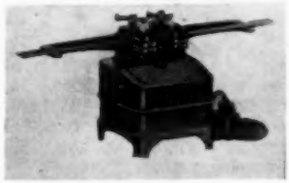


cross wires are heavier than No. 2. Heavy cross wires and rod, straightened and cut to size in advance, are fed automatically from a magazine. Cross and longitudinal spacings are fully adjustable.

Brazing Machine, Saw, Electric

Eisler Engineering Co., 759 S. 13th St., Newark, N. J. (Vol.78,p.685.) 312.

Bandsaw blades may be joined with this electric saw-brazing machine. The machine operates on 110 or 220 volts a.c., and is made in four sizes for brazing widths of stock up



to 3.35 in. The parts to be brazed, after being beveled, are lapped along these edges and clamped in the machine. The current is turned on to heat both ends of the blade and a piece of spelter simultaneously.

Arc-Welding Head, Automatic

General Electric Co., Schenectady, N. Y. (Vol.78,p.427.)

An improved Type WFA automatic arc-welding head is now available. One small motor drives the electrode feed rollers through a worm reduction gear and three-speed transmission. At any of the three speeds, selected to suit electrode size, current and rate of deposition of metal, the electrode is fed at a uniform rate and the arc voltage is maintained. Handwheels swing the nozzle through the complete circle in two planes at right angles to each other, thus permitting universal action.

Welder, 75-Amp.

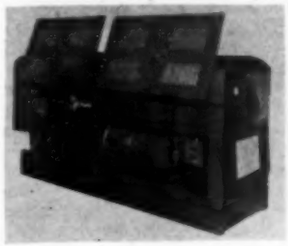
Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.784.) 363.

The SA 75 unit will deliver as low as 20 amp. at the arc without the use of auxiliary devices. The supply is a uniform current of proper characteristics for using electrodes as small as ⅛ in., and thus can be used on materials as light as 24 gage. The welder employs a 25-volt arc with a current range from 20 to 100 amp.

Welder, Engine-Driven

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.586.) 241.

The close-coupled, gas-engine-driven "Shield Arc" welder of 300-amp., 40-volt capacity, is more compact and of lighter weight than previous models.



The generator is mounted on the engine housing. A special idling device cuts the engine speed when the arc is broken. Other features include: dual control of the welding heat, sparkless commutation, controls at convenient height, and arc-welded steel construction. A remote control device, the "Lincontrol," enables the operator to adjust the current by tapping the electrode on the work.

Welding Control, Remote

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.327.) 91

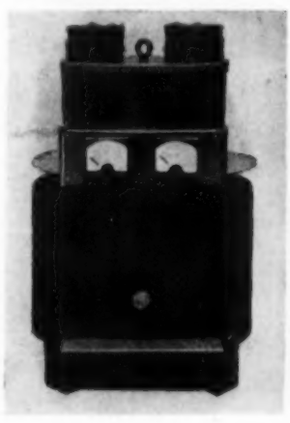
With the "Lincontrol" remote-control equipment on a portable arc welder, the operator taps the electrode on the work several times and the voltage is raised automatically. A larger number of taps and the voltage is lowered. By tapping the electrode, thus making and breaking the electrical circuit, the current output of the generator is controlled.

This method of control saves time wherever the welding is done at a distance from the machine. The Lincontrol may be purchased separately and installed on motor-driven, belt-driven or gasoline-engine welders now in use.

Welding Equipment, Arc, A.C.

General Electric Co., Schenectady, N. Y. (Vol.78,p.655.)

The a.c. line of arc-welding equipment includes transformer units, electrodes and automatic welding heads and controls. This equipment is intended for heavy current welding, primarily automatic welding, but is also suited to hand applications. Transformer units are available in three sizes, having one-hour ratings of 500, 750 and 1,000 amp. Primaries are wound for 220, 440 or 550 volts, 60, 50 or 25 cycles, single phase. Extra attachments are available for reducing the secondary open-circuit voltage to approximately 50 per cent of its normal value (normal being 80, 90 or 100 volts) and for obtaining currents down to 10 per cent of the one-hour rating.



Welder, Shielded-Arc, A.C.

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.857.) 403.

This a.c. welder of the motor-generator type takes two-phase or three-phase current of standard voltages and frequencies and converts it into alternating current of lower voltage and at the higher frequency most suitable for arc welding. Portable and stationary motor-driven models are built in two sizes. The smaller machine can be used for continuous welding with electrodes of ⅛ to ⅛ in. in size, and the larger welder handles electrodes from ¼ to ⅜ in. in size.

Welding Bench, Pipe

Oster Mfg. Co., 2057 E. 61st Place, Cleveland, Ohio. (Vol. 78,p.587.) 235.

A pipe welding assembly bench capable of handling all sizes of pipe up to 12 in. in diameter has been developed. The fixture will line the work up accurately and hold it in position for tacking fittings, flanges and branches at any angle.

For long lengths, an extension bench can be supplied. An adjustable elevator controls vertical alignment of the work. The main bench and extensions consist of an I-beam mounted on tubular legs.

Blowpipe, Cutting

Linde Air Products Co., 30 E. 42nd St., New York, N. Y. (Vol.78,p.489.) 204.

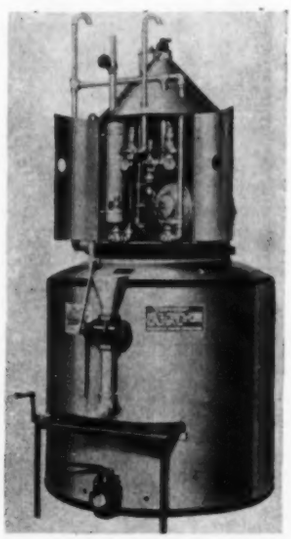
This Type C-24 blowpipe is capable of doing heavier work than any preceding Oxweld cutting blowpipe. Design features are: improved cutting oxygen valve; a long external cutting

valve lever; nozzles with seat protectors; closer spacing of the heating orifices about the cutting oxygen opening; new nozzle sizes; interchangeable inlet-needle-valves; and interchangeable low-pressure injector or medium-pressure mixer.

Generator, Acetylene

Linde Air Products Co., 20 E. 42nd St., New York, N. Y., (Vol.78,p.524.) 215.

An automatic, stationary acetylene generator, known as the Oxweld Type MP-5, and rated to deliver 1,000 cu.ft. of acetylene per hr., has been announced. The feed is of the gravity type. Set pressure is 13

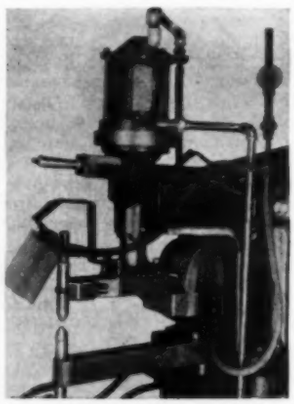


lb. per sq.in., the pressure variation within the generator being not more than ½ lb. A separate relief valve with a separate outdoor vent line is provided for the back-pressure valve. Two other relief valves with a common outdoor vent line are provided for the generator chamber.

Pressure Cylinder for Welding Machines

Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. (Vol.78,p.720.) 331.

Air or hydraulic cylinders have been adapted for use in modernizing manually operated



resistance welders. A cylinder is mounted on the flange of the barrel surrounding the ram that closes the electrode. A foot-operated valve enables the operator to secure the necessary pressure on the electrodes.

Torch, Arc, Automatic

Electric Torch Mfg. Co., 5321 Horton St., Emeryville, Calif. (Vol.78,p.722.) 338.

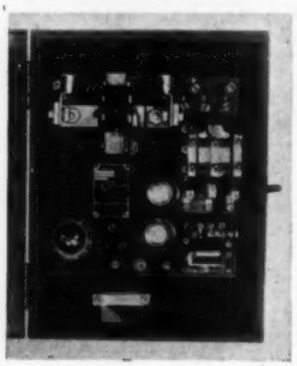
The "Roffy" automatic torch operates on 110-volt lighting circuits protected by a 30-amp. fuse. The torch handle is designed to enable the operator to adjust the flame while in op-

eration and to start and stop the arc at will. The torch is primarily designed as a production apparatus on sheet metal and other light parts and for repair work on material up to ¼ in.

Timer, Weld

Electric Controller & Mfg. Co., 2702 E. 79th St., Cleveland, Ohio. (Vol.78,p.689.) 301.

The Folio 2 automatic timer has been developed for use with

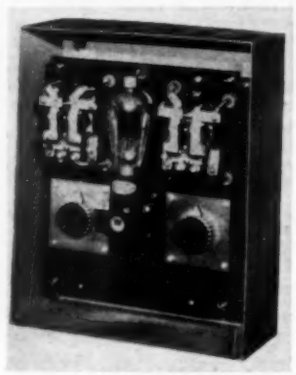


resistance welding machines. In addition to the adjusting dial for varying the time supplied, the No. 2 timer also is equipped with a means to provide a triple current range for a timer of a given capacity.

Timer, Weld Electronic

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. (Vol. 78,p.330.) 63.

The Type HA electronic timer is for use in connection with such operations as timing of current flow on spot and projection welders. The time measured is continuously adjustable

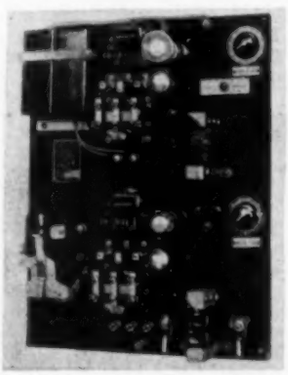


from ⅓ sec. to 45 sec. An industrial-type grid-glow tube operates the contactor directly. The contact capacity is 10 amp. at 115 volts and 5 amp. at 220 volts, a.c.

Timer, Weld, Automatic-Repeat

Electric Controller & Mfg. Co., 2702 E. 79th St., Cleveland, Ohio. (Vol.78,p.786.) 361.

This timer is for use in connection with resistance welding machines in which the electrodes are air- or motor-operated. It has a timing circuit for governing the length of time the elec-

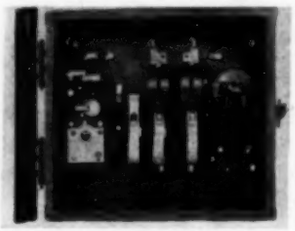


trodes of the welding machine are separated. The "welding period" assures that the correct number of heat units are put into each weld, while the "off-time" is a definite length of time which is adjustable. The period is in inverse proportion to rate of current flow.

Timer for Spot Welders, Automatic

General Electric Co., Schenectady, N. Y. (Vol.78,p.812.)

A Type CR7393 synchronous-motor-operated timer automatically times the power supply to resistance welders, by controlling the contactor on the welder.

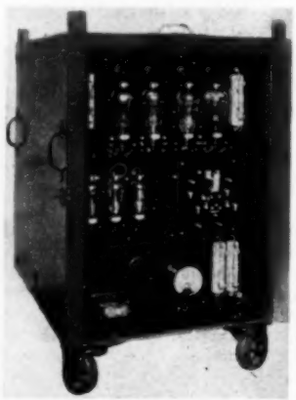


Once set the time is unaffected by the line-voltage variations or surges. A range from ½ to 5.6 sec. in one-cycle steps (60-cycle supply) is available, a range which is suitable for all usual welding.

Timer, Welding, "Ignitron"

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (Vol.78,p.784.) 188.

A portable "Ignitron" welding timer for use with resistance welding machines will pass electrical current for periods as short as one cycle (1/60 sec.) and is adjustable up to 30



cycles (½ sec.). The dimensions are: 46 in. high, 42 in. long and 29 in. wide. Weight, 700 lb. A unit of this size will carry as high as 700 kva., 440 volts, single phase.

Electrode for Cast Iron, "Ferroweld"

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.135.) 18.

The "Ferroweld" electrode consists of a steel core surrounded by a heavy flux coating and is manufactured in one size, ⅛ in. It is used to weld cast iron with approximately 80 amp. Welding is done intermittently, not over a 3 in. bead being laid down at one time. As each bead is welded it is peened lightly, cleaned and allowed to cool.

Electrode, "Hobronz"

Hobart Bros. Co., Troy, Ohio. (Vol.78,p.139.) 20.

An economical method of welding copper by the electric arc process has been announced. By this method, using a specially developed electrode known as "Hobronz," it is possible to weld at the rate of 12 to 24 in. per min., and to obtain a strength practically 100 per cent of the strength of annealed copper. The "Long Arc" method of welding demands exceptionally high voltage across the arc. A special carbon holder must be used.

Electrode for Steel, Hard-Surfacing

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.262.)

"Wearweld" shielded-arc electrode is offered for building up steel surfaces to resist shock and abrasion. The electrode can be used to build up all steels other than those of the austenitic type. A single layer on mild steel has a hardness of 40 to 45 Rockwell C, and additional layers will have a hardness of 48 to 52 Rockwell C. Two sizes are ¼ and 5/32 in. by 18 in. long.

Electrode, High-Tensile

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.359.)

Welds with tensile strengths of 85,000 to 100,000 lb. per sq.in. can be made with the arc welding electrode, "Shield - Arc Eighty-Five." This electrode is designed for use on high-tensile steels. Ductility ranges from 15 to 20 per cent elongation in 2 in. The material is heavily coated and particularly suited for welding those low-alloy structural steels which on normalizing have tensile strengths to 100,000 lb. per sq.in. Electrode sizes, 5/32 and 3/16 in.

Electrode, General-Purpose

General Electric Co., Schenectady, N. Y. (Vol.78,p.359.)

A general-purpose W-22 electrode of the heavily coated or shielded-arc type for producing welds required on Class I pressure vessels has been developed. This electrode may be used in any position and has heat-penetrating properties. It is therefore equally suitable for butt and fillet welds. Tensile strength, 65,000 to 75,000 lb. per sq.in.

Electrode, Welding

Metal & Thermit Corp., 120 Broadway, New York, N. Y. (Vol.78,p.454.) 173.

A "Special A" electrode hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. The deposit contains a small quantity of nickel. Tensile strength is 73,000 lb. per sq.in., yield point 59,000 lb. per sq.in., reduction in area 63.5 per cent. Other recently developed Murex electrodes, designed for use with the latest high-strength steels, make possible welds with tensile strengths of 85,000 to 100,000 lb. per sq.in.

Electrode, Coated, General-Purpose

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.521.)

"Fleetweld No. 7" is a general-purpose, heavily coated electrode for welding mild steel with the shielded arc process. Tensile strength ranges from 70,000 to 80,000 lb. per sq.in., the yield point from 55,000 to 60,000 lb. per sq.in., and the elongation approximately 20 per cent in 2 in. The ⅛, 5/32 and 3/16 in. sizes are designed for welding in flat, vertical or overhead position and the 5/32, ¼, 5/16 and ⅜ in. sizes in the flat position only. The 14-in. length is furnished.

Electrode, Coated, Arc-Welding

General Electric Co., Schenectady, N. Y. (Vol.78,p.684.)

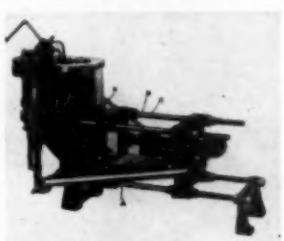
For production of high-speed, high-quality welds in the flat position, the Type W-23 heavily coated arc-welding electrode has been developed. The electrode is suitable for either manual or automatic arc welding, and is said to produce equally good results on either a.c. or d.c. Type W-23 operates at higher speed, in larger diameters (¼, 5/16 and ⅜ in.) and at higher current values than commonly used.

Other Machines

Die-Casting Machines, Nos. 4 and 500

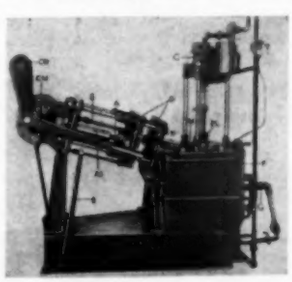
Newton-New Haven Co., New Haven, Conn. (Vol.78,p. 523.) 207.

The No. 4 bench-type machine will produce from 6 to 20 castings per minute. The melting pot has an atmospheric burner attached directly to a thermostat. Pot capacity is 20 lb. of



metal, die capacity is 4x4 in., length 24 in., height 18 in.; width 12 in., and weight 50 lb. Dies can be made with hand-operated or automatic core pulls.

The No. 500 four-bar machine is a heavy-duty plunger type for pressure casting zinc and zinc alloys. The metal is melted in the pot by atmospheric control. Self-aligning dies are clamped to a bolster with T-slot bolts. The casting operation is made

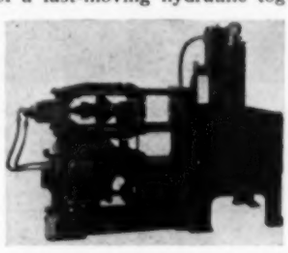


by moving lever *B* to the left to operate the plunger of air cylinder *C*. This drives plunger *PL* down and forces the metal into the dies through nozzle *N*. Castings are automatically ejected. Specifications: Length 8 ft. 6 in.; width, 3 ft. 7 in.; height, 5 ft. 9 in.; weight 2,200 lb.; die capacity, 9 x 11 in. x 9 in. thick; furnace capacity, 200 lb. of metal; casting rate, 5 to 12 shots per min.

Die-Casting Machine, Hydraulic, High-Speed

Lester Engineering Co., 278 Rockefeller Bldg., Cleveland, Ohio. (Vol.78,p.751.) 340.

Die-casting machine, No. H-HP-1 obtains pressure for injection of the metal into the die from a built-in hydraulic pump. High speed is obtained by means of a fast-moving hydraulic tog-

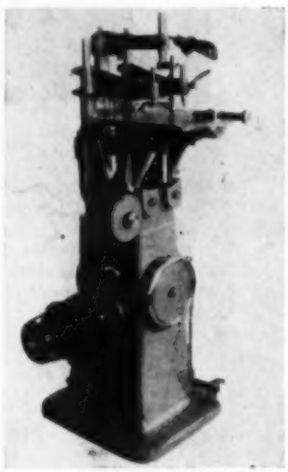


gle mechanism for die movement. This device develops a locking pressure of 35 tons. Wear between the plunger and metal cylinder is taken up automatically so that the metal pressure is always maintained. Specifications: Die opening, 5 in.; maximum die height, 12 in.; minimum die height, 4 in.; clearance between bars, 12x10 in.; metal pot capacity (zinc) 300 lb.; plunger capacity, 5 lb.

Filing Machine, Heavy-Duty

Oliver Instrument Co., Adrian, Mich. (Vol.78,p.487.)

Sawing or filing metal up to 3 in. in thickness, or filing heavier material with a shorter stroke, can be done on this heavy-duty die-making machine. The stroke is adjustable from 0 to 5 in., and the six speeds range from 100 to 300 strokes per minute. Any parallel file



or any size saw from the smallest to the heavy machine saws can be held in the clamps. A continuous blast of air keeps the work clean. A hydraulic feeding device relieves the saw or file on the upstroke and feeds the work while filing. The table is 14 in. square and tilts 15 deg. to the front, right and left, and 3 deg. to the rear. Power is supplied by a ¾-hp. motor.

Filing Machine

Grob Bros., South 97th St. & West National Ave., West Allis, Wis. (Vol.78,p.688.) 313.

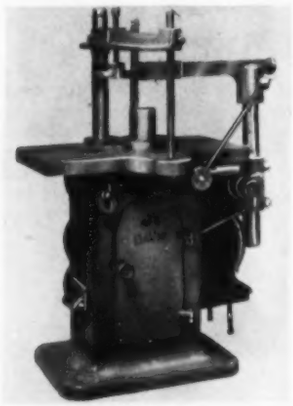
A bench-type Model B-3 filing machine cuts continuously by means of an endless file-chain. The machine has a three-speed V-belt drive. Material up to 4

in. thick can be filed, and the file chain can be inserted into openings as small as ½ in. in diameter. The tiltable table measures 15x17 in., and is 14 in. above the bench.

Keyseating Machine, Vertical

Davis Keyseater Co., 399 Exchange St., Rochester, N. Y. (Vol.78,p.299.) 72.

A keyseating machine is being built with a tilting table so that both straight and tapered keyways can be cut. The table front is raised or lowered up to a taper of approximately 3 in. per ft. The cutter is maintained in a vertical position. A

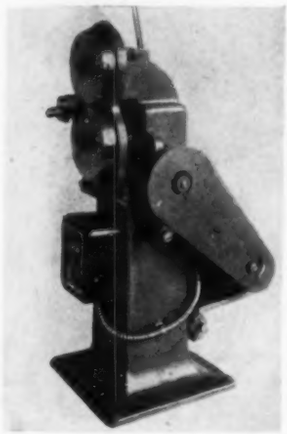


saw or broach-type cutter having several teeth cutting at one time is employed. The cutter is fastened to a crosshead that gives it the reciprocating motion. Feed is of the table type, operated by hand lever.

Marking Machine, Strip

Noble & Westbrook Mfg. Co., East Hartford, Conn. (Vol.78, p.460.) 180.

This No. 19-H machine will mark a name or address, trademark or design, either continuously or at every few inches on strip or ribbon stock from ¾ to 1¼ or 2 in. wide and from 0.025 to ⅛ in. thick. A worm and gear drive is powered by a motor. The top roll of the machine carries the marking die and bottom roll the pressure roll. Both rolls are geared together and act to apply pressure for making the mark and also as a friction drive to carry the stock forward automatically. The distance between the rolls

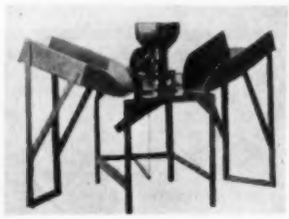


is secured by an eccentric shaft attached to the upper roll. Two speeds of operation are 125 and 200 ft. per min.

Nutting Machine, ⅜-In.

Kent Machine Co., Cuyahoga Falls, Ohio. (Vol.78,p.786.)

Nuts can be threaded on screws of ⅜ in. diameter or less with this nutting machine. The nuts are fed down two chutes from one common hopper. At the bottom of the chutes the nuts are transferred to rotating

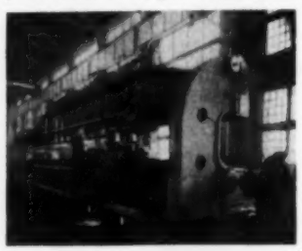


heads by specially designed spring-actuated plungers controlled by a treadle. The operator takes two bolts and places them in contact with the nuts and the spinning action of the rotating heads threads the nuts on the bolts.

Planer, Plate, Heavy-Duty

Baldwin-Southwark Corp., Philadelphia, Pa. (Vol.78,p. 886.) 427.

This heavy-duty plate planer will plane a plate edge 36 ft. long by 4.7 in. thick and will make an 18 in. scarf, or slope, on the edge. The cutting speed is variable from 15 to 45 ft. per min., and cuts are made in both directions of travel of the toolholder. Tool feed is from 1/128 in. to 1 in. per cut. Maxi-

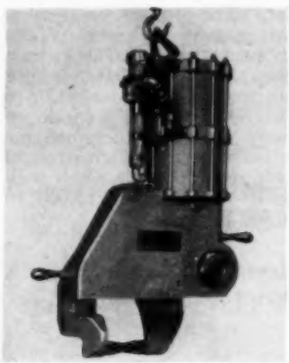


mum vertical adjustment of the tool is 10½ in. and the maximum horizontal adjustment is 24 in. The drive screw is 7 in. in diameter by 58 ft. long, and has a quintuple thread. This screw runs in roller bearings. Pneumatically operated hold-downs grip and clamp the plate.

Riveter, Squeeze, Alligator-Type

Hanna Engineering Works, 1765 Elston Ave., Wicker Park Station, Chicago, Ill. (Vol.78, p.296.) 88.

The machine illustrated develops 20 tons between dies, which is sufficient for heading

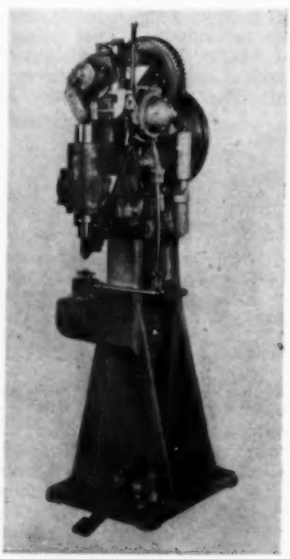


⅜-in. rivets cold and ⅝-in. rivets hot. Die stroke is 2 in. Both jaws of the alligator type riveter can be entered into a pocket or pockets to head a rivet which could not be reached otherwise.

Riveting Machine, Squeeze-Type

Norin Engineering Co., 355 Union Park Court, Chicago, Ill. (Vol.78,p.28.) 9.

A mechanical squeeze riveter, with arrangement for the automatic feeding of rivets is offered. Rivet-receiving fingers are mounted around the upper die. The lower die is made in two parts; a work-locating pin and a main die. The pin protrudes above the lower die surface, and is pushed down by

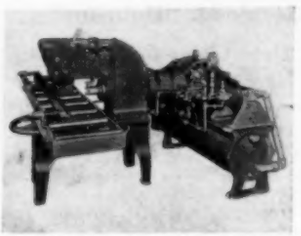


the rivet. The pin is stopped at a predetedmined height at which it forms a part of the lower die. A work-closing arrangement insures closeness between the parts to be riveted.

Riveting Machine, Hydraulic

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill. (Vol.78,p.890.) 439.

The 50-ton hydraulic riveting machine is being used for heading several rows of ¾-in. hot



rivets on track frames for crawler-type tractors. The work is advanced between the dies on a roller-bearing equipped conveyor. By means of a vertical adjustment the various rows of rivets are brought into alignment with the dies. The riveting cycle is completed automatically. Maximum working pressure is 1,600 lb. per sq.in. and may be reduced for heading smaller rivets.

Saw, Electric-Arc

Rich Mfg. Co., 3851 Santa Fe Ave., Los Angeles, Calif. (Vol. 78,p.690.) 309.

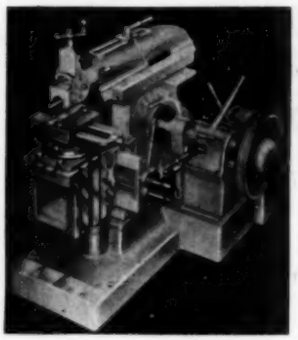
This saw employs an arc to bring the metal to a plastic or molten condition after which pressure created by the saw forces the molten metal from the scarf. The saw blade is of circular form and carries a multi-

tude of small straight teeth on its circumference. The arc is concentrated on the material directly in front of the teeth. Usually overheating does not extend more than one millimeter under the surface of the metal.

Shapers With V-Ram

Western Machine Tool Works, Holland, Mich. (Vol. 78,p.456.) 169.

"Steptoe" shapers range in size from 14-in., single gear, to 24 in., backgear, with a V-type

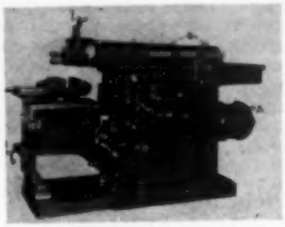


ram. These machines also have an extra-large head that can be swiveled through an arc of 120 deg. A fingertrip-control feed mechanism and centralized control are provided. A speed-box is arranged with a Twin Disk clutch. The rocker arm block is of one-piece construction. The machine can also be equipped with a forced-feed continuous lubricating system.

Shaper, Hydraulic, Improved

Rockford Machine Tool Co., Rockford, Ill. (Vol.78,p.553.)

The hydraulic power for feeds and rapid traverses in the improved "Hy-Draulic" shaper is applied directly to the table and rail in a manner similar to that of the ram drive without any intervening mechanism. A flange-mounted motor drives the machine more directly than previously. Controls for the hydraulic power circuits are grouped in a panel on the operator's side of the machine. The table and rail support are clamped by a single movement of levers instead of by several clamping nuts. The stop for the cross-feed screw now has a micrometer adjustment that can be set to remove any desired quantity of metal to 0.001 in., and then the feed stops automatically. A single lever controls direction of all feeds and rapid traverses.



Machine Accessories

Boring Bar

Russell Boring Bar Co., 1207 Calumet Ave., Middletown, Ohio. (Vol.78, p.362.) 134.

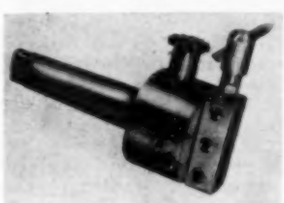
A boring bar has been placed on the market to bore from $\frac{3}{8}$ to 12 in. in diameter. It has micrometer adjustments. Shanks for this tool may be made up in Nos. 9, 10, 11 or 12 Brown

& Sharpe tapers or Nos. 4, 5 or 6 Morse tapers, and all shanks are interchangeable. Three interchangeable boring bars slide and clamp in the T-slot of the main head.

Boring Head, Turning and Facing

C. C. Craley Mfg. Co., P.O. Box 192, Shillington, Pa. (Vol. 78,p.859.) 413.

This boring, turning and facing head bore and face work up to 13 in. in diameter, and turn the outside diameter of studs or bosses up to 4½ in. in diameter. The head is made of steel, being 4 in. in diameter by 2⅞ in. long. The sliding block is 4 in. long, 1½ in. wide by 2½ in. deep and has four openings

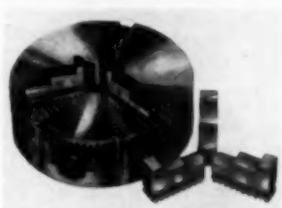


¾ in. in diameter to receive the boring and turning tools. Three of these openings are arranged in the front and the fourth is in the end. Tools are held rigidly by three socket-head screws. The barrel is graduated in thousandths and has a star adjustment. The sliding block has 1 in. adjustment right or left wheel on the outer end for adhand from zero, for either power or hand feed.

Chucks, Bench-Lathe

Cushman Chuck Co., Hartford, Conn. (Vol.78,p.753.). 345.

Two bench-lathe chucks have been developed, one a self-centering type of light weight known as the No. 340, and the other an independent four-jaw chuck designated as the No. 140.



The guaranteed centering accuracy for the No. 340 chuck is within 0.003 in. This chuck is 5 in. in diameter and weighs 6½ lb. The No. 140 independent 4-jar chuck is 6 in. in diameter and weighs approximately 11½ lb.

Chuck, End-Mill

Thurston Mfg. Co., Providence, R. I. (Vol.78,p.588.)

An improved double end mill chuck is designed for use with the "Thurco" double end mill.

Different sizes of mills are interchangeable in all chucks, limited of course, by the size of the chuck. The B-412 chuck which has a No. 12 B & S taper takes the entire range of double-end mills from ⅛ to 1¼ in. in diameter. The taper thread locks the mill positively. Chucks are supplied in eight sizes.

Collets for Automatics, Compensating, Style "G"

Sutton Tool Co., 2842 W. Grand Blvd., Detroit, Mich. (Vol.78,p.202.) 57.

A master collet with interchangeable and replaceable pads for automatic and hand screw machines is being offered. The pads of this Style "G" collet are self-adjusting. An angular seat in the master and a radius on the back of the pad provide a two-line contact between pads

and master, allowing pads to rock in two directions to afford a bearing on the stock. Pins in the master engage blind holes in the pads to prevent the pads from rotating. A flat spring holds the pads securely against the master. One master and sets of pads will handle the full range of a machine.

Counterbore, Radial-Drive

Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich. (Vol.78,p.138.) 1.

In this radial-drive counterbore two radially arranged integral abutting surfaces are located between two ground cylin-

drical surfaces of different size. The two driving faces are arranged on a line through the common center of holder and cutter shank and only a radial or turning action results upon the tool in operation. Cutter-shank driven faces are integral, being formed into the solid shank. The lateral internal lock retains the cutter in driving position. Radial drive interchangeable counterbores, countersinks and multi-diameter boring cutters are supplied in all standard and special sizes from ⅜ to 4½ in. in diameter.

Cutters, Milling, Inserted-Blade

Coules Tool Co., Cleveland, Ohio. (Vol.78,p.654.) 284.

"Rigid Back" milling cutters are available in 8 different styles and 51 sizes. For rigid support the back face of the blade is ground flat and the supporting surface in the body is also ground flat. The front face of the blade has serrations that

match serrations on the tapered wedge. Repeated sharpening of the blade can be accomplished. Cutter bodies are made regularly of heat-treated alloy steel and are equipped with high-speed steel blades. Cemented-carbide tipped blades can be furnished.

Cutter, Face-Milling, General-Purpose

Carboloy Co., Inc., 2489 E. Grand Blvd., Detroit, Mich. (Vol.78,p.328.) 86.

A general-purpose face-milling cutter is being marketed for universal use on cast iron, nonferrous and non-metallic materials. This cutter is intended for economical use on short run, diversified milling jobs. It

is possible to use the standard Carboloy cutter interchangeably on various milling jobs in the same manner as a high-speed steel cutter.

Cutters, Face-Milling

Ingersoll Milling Machine Co., Rockford, Ill. (Vol.78,p. 856.) 415.

The Type N B heavy-duty face-milling cutters have the following features: a $\frac{1}{16}$ in. cutting edge on the periphery for deep cuts; a 1-in. cutting edge on the face to insure a good finish; a $1\frac{1}{4}$ in. blade projection

beyond the face of the housing for chip clearance. Standard N B cutters are furnished from 8 to 16 in. in diameter. All cutters have keyways 1 in. wide by 1 in. deep and are driven by two radial keys. Each blade is held in position by a hardened wedge. The body or housing is an alloy steel forging.

Cutting Material, Titanium-Carbide

American Cutting Alloys, Inc., 347 Madison Ave., New York, N. Y. (Vol.78,p.135.)

"Cutanit" titanium carbide is used for cemented carbide tipped tools for cutting of metals and is offered particularly for cutting steel. It is also used for parts subject to abrasive wear. It is resistant against oxidation and cuts smoothly. It is claimed to stand up well under heavy and interrupted cuts.

Cutting Material, Cemented-Carbide

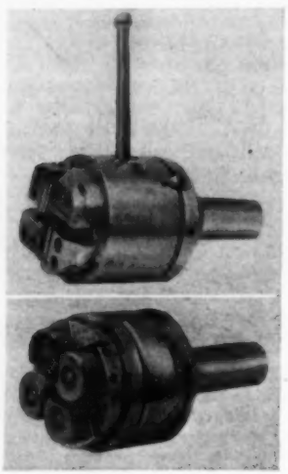
Carboloy Co., Inc., Detroit, Mich. (Vol.78,p.489.) 195.

Six additional grades of Carboloy cemented carbide have been developed. These additions supplement the six existing grades, and have been developed primarily to obtain improved performance in special fields of application. Among these applications are: rough and finish boring, finish turning, and facing of steel brake drums; single-point finish boring of steel connecting rods; reboring of automotive cylinders, and turning, facing and boring of piston rings. The six grades are designated as 715, 831, 883, 905, 906 and 907.

Dieheads for Tangential or Circular Chasers

Geometric Tool Co., New Haven, Conn. (Vol.78,p.32.) 7.

This combination diehead will take either circular or tangential chasers. The chaser holders can be extracted from the head without its removal from the machine. Improvements include: chaser holder support made rigid by heavy T-slots and broad reinforcing wings; a

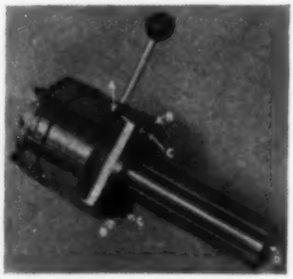


post support for the circular chaser which is integral with the holder; and an improved four-point bearing for the tangent chaser.

Dieheads, Tangent, Stationary-Type

Jones & Lamson Machine Co., Springfield, Vt. (Vol.78,p. 394.) 148.

Pull-off type, stationary, tangent dieheads in five sizes are built in a threading range from No. 8-32 to 2 in. in diameter. Chaser holders are ground and lapped on the dovetails, and can be changed without disassembling the die. Chasers are ground in the thread and are interchangeable in revolving and stationary dies of the same capacity. Only one set of chaser holders is required for any right-



hand thread within the rated die capacity, whether standard or special, and regardless of the diameter or pitch. By controlling the float in the shank the face of the die remains more nearly at right angles to the work.

Diehead, Removable-Chaser

Geometric Tool Co., New Haven, Conn. (Vol.78,p.813.)

The style EJ removable-chaser diehead is used for cutting very small diameter, short-pitch threads. The $\frac{3}{4}$-in. Style EJ diehead complete with chasers

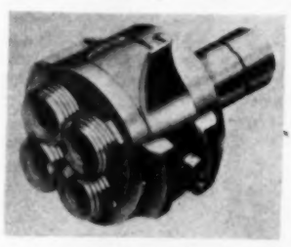
weighs but 3 oz. It is built to cut threads from No. 0 to No. 14 machine-screw sizes and in pitches of 20 threads or finer.

Dieheads for B&S Automatics

National Acme Co., Cleveland, Ohio. (Vol.78,p.854.) 420.

This line of self-opening dieheads may be had either with milled or ground-thread circular chasers. The tools are the pull-off type with safety release. Parts are interchangeable. Chasers are mounted externally to the head.

Each chaser is essentially a circular forming tool. The

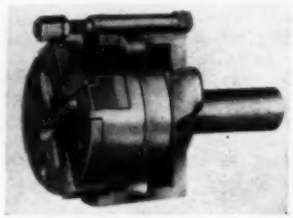


chaser can be ground repeatedly until the entire periphery has been used up. The same chaser may be used either right or left-hand by changing the chaser from a right- to a left-hand chaser block and grinding on the opposite face. These dieheads are made for all sizes of Brown & Sharpe automatics and have a minimum cutting capacity of 0.056 in.

Diehead, Inserted-Chaser

Eastern Machine Screw Corp., New Haven, Conn. (Vol.78,p. 855.) 409.

The diehead illustrated is known as the No. 101 size of the Style DM. It is for use

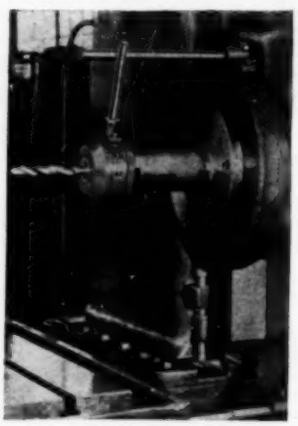


on Brown & Sharpe automatics and is equipped with both adjustable pull-off trip and adjustable head-end trip. Capacity of the diehead is as follows: up to and including $\frac{3}{8}$ in. diameter, a thread length of $3\frac{1}{2}$ in.; up to and including $\frac{9}{16}$ in. in diameter, a thread length of $1\frac{1}{16}$ in.; up to and including $\frac{3}{4}$ in. in diameter, thread length of $\frac{1}{16}$ in.

Drill Speeder

Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich. (Vol.78,p.137.)

A drill speeder unit has been developed for horizontal boring and milling machines, radial drills and similar machines. By its use the operator can increase the range of speeds on his



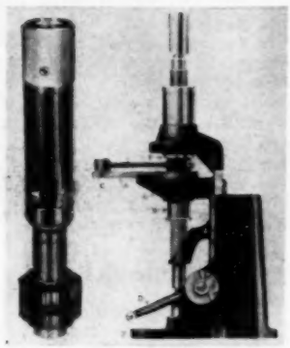
machine from the minimum machine speed to 2,800 r.p.m. which is the maximum speed of the unit. The units are furnished with No. 5 Morse taper drive.

Hone for Connecting-Rod Bearing Seats

Hutto Engineering Co., Inc., Detroit, Mich. (Vol.78,p.298.)

A hone has been developed for finishing connecting-rod bores as seats for steel-backed babbitted bearings. The hone finishes only one rod at a time, and is expanded either automatically or by hand. Either method includes a micrometer adjustment. The "universal" movement overcomes the effect of lack of parallelism between the rod faces and their squareness to the nominal axis of the bore. Automatic control of the expansion of the abrasive stones prevents oversize honing.

A special fixture has been developed to facilitate the honing operation. Moving the

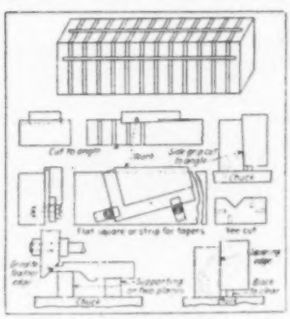


lever downward raises the table and clamps the rod securely between the plate and the lower end of the bushing, after which the rod and the table move upward together. The hone is contracted when entering the bore and expands automatically when inserted.

Jig Blocks, Magnetic

Barker Tool, Die & Gauge Co., 5529 Ellery Ave., Detroit, Mich. (Vol.78p.488.) 197.

These magnetic work-holding devices can be made in the shapes or forms illustrated, or in other types because either the magnetic elements or the pole separators may be cast as best



suited to requirements. The devices may be used as a magnetic jig or top plate for magnetic chucks in connection with a magnetic field produced by any suitable means.

Jig, Tool

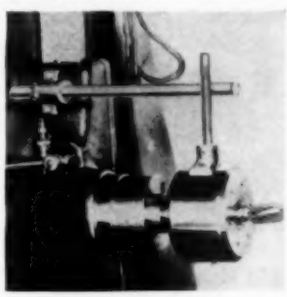
City Machine & Tool Co., Dayton, Ohio. (Vol.78,p.423.)

The Paulins linkage and locking designs have been retained in the "Cimatool-Paulins" tool jigs now being offered. In the spring-type mechanism the two springs exert from 0 to 105 lb. pressure. Bushing plates and other details for both the single- and double-post models have been simplified. This redesign also includes both positive-lock and spring-type mechanisms. All parts of the toggle and clamping mechanism are fully inclosed, and a larger diameter barrel increases the strength of the tool. In the illustration these are shown in open and closed heights of the device.

Milling Head, High-Speed

Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich. (Vol.78,p. 753.) 353.

This high-speed milling head is adapted for use on horizontal boring mills and milling machines. Step-up ratio of the head is four to one over the spindle speed of the machine.



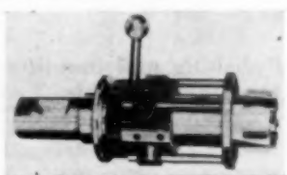
The unit is designed for a top speed of 1,500 r.p.m. on the high-speed milling spindle and has a maximum capacity of 1 in. end mills and 1 in. drills in steel. The body of the milling head and the driving shank are of one-piece construction.

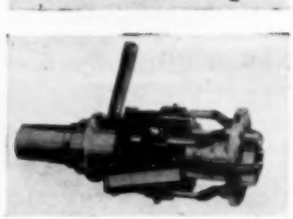
Taps, Collapsible

Landis Machine Co., Waynesboro, Pa. (Vol.78,p.201.) 49.

The taps are made in two types: The Style LT, a collapsible tap for either straight or taper tapping, and the Style LM receding-chaser, collapsible tap for taper tapping. The taps consist of two units, a body containing the operating mechanisms and a head in which the chasers are supported. The same tap body may be used for either right or left hand tapping.

The collapsing mechanism is positive in action both with respect to locking the chasers



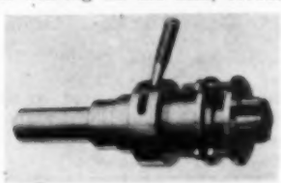


in the cutting position and in collapsing action. The trip ring is adjustable for various thread lengths. Tap heads are adjustable through a screw at the front end of the plunger. Chasers are supported in slots in the tap head. All locating surfaces of the chasers, as well as the thread form itself, are precision ground. Style LT is made in five sizes which, when equipped with the proper tap heads, cover a combined range from 1¼ to 12 in. pipe or 1½ to 13⅝ in. in diameter.

Taps, Collapsible

Murchey Machine & Tool Co., Detroit, Mich. (Vol.78,p. 296.) 97.

Type C standard collapsible machine and pipe taps may be used as stationary taps with the handle in place, or rotating taps with the handle removed. The trip ring may be adjusted to cut any length of thread within the capacity of the tap. Type C taps are collapsed by means of a hardened tripping ring coming in contact with the work. This contact releases the roller from its bearing on the cam, forcing

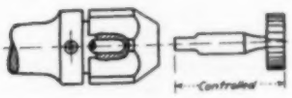


the center pin backward. Chasers are expanded by means of a lever handle in a non-rotating tap or by a sliding collar in the case of the rotary tap. Adjustment for size is accomplished by an internal adjustment from the front end of the tap. Sizes from 1¼ in. to 12 in. are available.

Toolholder and Cutter

Goodspeed-Detroit Co., 2832 E. Grand Blvd., Detroit, Mich. (Vol.78,p.521.) 222.

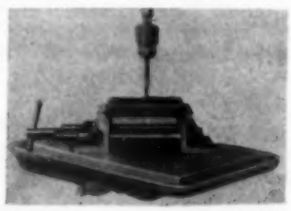
In the "Go-Det-Co" positive drive holder for Woodruff keyway cutters there is an adjustable stop to back up the cutters, giving a range of adjustment within the holder of ¼ in., and easily adjusted to within one or two thousandths. With this holder and with the positive drive, "controlled length" keyway cutters, after a production job is set up with a cutter in the correct location no further adjustment of either holder or machine table need be made when changing cutters. The holders can be furnished with a No. 9, 10 or 11 B. & S. taper shank and with either a regular tang or draw-bar construction.



Vise, Drill-Press

National Machine Tool Co., Racine, Wis. (Vol.78,p.684.) 324.

This drill press vise with built-in parallels can be used from three sides. Holes can be drilled through and there is a 2 in. clearance. Cross holes can be drilled easily in round shafting by using the V-groove



below the parallels. Three models are built: No. 1 having a jaw opening of 3 in.; No. 2 a jaw opening of 10 in. and No. 3 a jaw opening of 10 in. Widths of jaws are 2½, 6 and 8 in. respectively, and the depths, ¾, 2 and 3 in.

Wheel, Dressing, Diamond

Carborundum Co., Niagara Falls, N. Y. (Vol.78,p.722.) 339.

A diamond dressing wheel for shaping and conditioning the hard cemented carbides has been announced. The diamonds used in the manufacture of this wheel are of the South African variety. Three grits are supplied—90 grit, the coarse; 220 grit, the fine; and 400 grit, the extra fine. Stocks are available in 6 and 7 in. diameters for peripheral and side grinding.

Because the regular or solid wheels with diamonds as the abrasive would be prohibitive in cost, a composition form or backing was devised to which is applied a coating of the diamonds and the bond. This layer is ⅛ in. thick. The wheels are of such nature as to require that cutting or grinding be done wet. The wheel produces a mirror finish. Tool tips have smooth, clean edges and the faces are flat. The tools are ready for use after grinding on the fine wheel without lapping.

Lapping Wheels for Carbides, Extra-Fine

Thos. Prosser & Son, 15 Gold St., New York, N. Y. (Vol.78, p.459.) 181.

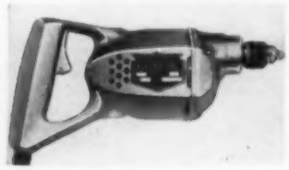
"Spedia Wheels" (diamond impregnated lapping wheels made of molded bakelite) are available in an extra-fine grade for polishing Widia and other cemented carbides. Also available is a taper cup wheel 3 in. in diameter for use on cutter grinders, and made in the regular lapping grade.

Portable Tools

Drill, Electric, ¼-In.

Black & Decker Mfg. Co., Towson, Md. (Vol.78,p.428.)

Increased power and antifrictional bearings are two features of this ¼-in. special electric drill. Armature and chuck spindle are mounted on ball

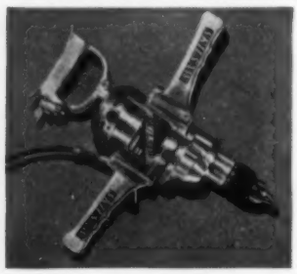


bearings. Universal motor is furnished for all voltages. Weight, 5¾ lb.

Drill, Electric, ⅝-In.

Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill. (Vol.78,p. 885.) 430.

The ⅝-in. standard drill of this line has a universal motor in which the armature is statically and dynamically balanced to eliminate vibration. The drill is housed in a die-cast,



aluminum-alloy body. Ball bearings are used throughout the motor, spindle and gear mountings. Free speed is 500 r.p.m. and weight of the machine is 15 lb.

Drill, Electric, High-Frequency

Buckeye Portable Tool Co., Dayton, Ohio. (Vol.78,p.888.)

The "Hercules" No. 31 electric drill is a general-purpose tool equipped with a high-frequency motor, and is obtainable with side handle and switch, as well as in the spade handle design illustrated. Motor specifications: 3-phase, 180-cycles, 110 or 225 volts. The drill has the capacity of ⅜-in., and light ¼-in. drilling. This drill is 15¼ in. in length and weighs 10½ lb.

Grinder, Die, Hand

Dumore Co., Racine, Wis. (Vol.78,p.781.) 356.

Although the motor develops ⅛ hp., the grinder weighs only 7 lb. A feature is an air filter which keeps out the grinding dust. Overheating of the tool is prevented by a vacuum cleaner type of ventilating fan. The tool operates at a speed of

14,250 r.p.m. The tool comes complete with wheel arbor, chuck for mounted wheels, small extension spindle and two grinding wheels.

Grinder, Electric, Hand

Dumore Co., Racine, Wis. (Vol.78,p.329.) 115.

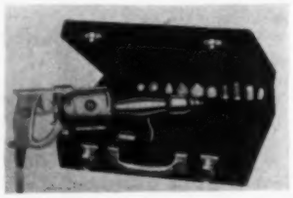
Known as the Model 8-HG, the grinder weighs only 1 lb. 10 oz., and is balanced so that it can be held in the hand and used like a pencil. A 1/40-hp.

universal motor drives the tool at 15,000 r.p.m. Regular equipment includes a ⅛ in. chuck.

Grinders, Electric

U. S. Electrical Tool Co., 2488-96 W. Sixth St., Cincinnati, Ohio. (Vol.78,p.584) 224

Two Hi-Speed grinders are being offered. Both have a speed of 17,000 r.p.m., and can be furnished with or without

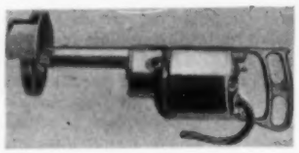


back handles. The motors are universal. These tools have concealed three-jaw gear chucks of ¼-in. capacity.

Grinder, Electric

Signal Electric Mfg. Co., Menominee, Mich. (Vol.78,p. 555) 234.

The body and handle of this light-duty portable electric grinder are of cast aluminum;



entire weight is 9 lb. Overall length is 14⅛ in.; diameter, 4 in. A universal motor for 110 volts, 25 to 60 cycles, is supplied. Speed at no load is 3,400 r.p.m., and the current taken is 1.5 amp.

Grinder, Electric

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill. (Vol.78,p.720) 327.

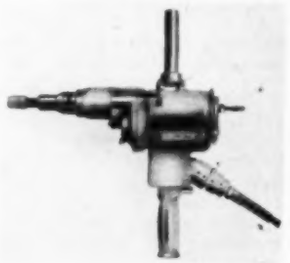
The grinder weighs 4 lb., operates at 17,000 r.p.m., and will drive a 2-in. wheel. A built-in, viscous-type air filter keeps out

dust and abrasive matter. The tool is designed to work at an angle and to get into and around corners.

Nut Runner, High-Frequency

Buckeye Portable Tool Co., Dayton, Ohio. (Vol.78,p.361)

A high-frequency, electric nut runner with an adjustable releasing clutch that tightens the nut without shock to the operator is being introduced. The



tool is made in a number of sizes. Specifications for the No. 30-N, illustrated, are: 3 phase, 180 cycles, 225 volts; speed, 750 r.p.m.; capacity, 5/16 in. and light ⅜-in. nuts; length, 14 in. weight, 16½ lb.

Polishing and Sanding Machine, Portable

Buckeye Portable Tool Co., Dayton, Ohio. (Vol 78,p.233)

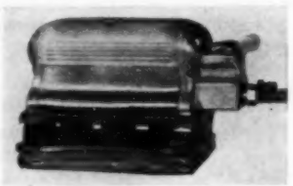
Two high-frequency electric portable tools have been developed as follows: No. 57-18—

polishing and rubbing tool, and No. 56-4700 sander. The first is used for rubbing down and polishing lacquer. Specifications are 2-phase, 180 cycles, 225 volts; speed 1,800 r.p.m.; capacity, 8- to 9-in. disks with rubbing pad or lamb's wool; overall length, 16¼ in., weight, 10½ lb. The sander runs at 4,700 r.p.m. and is equipped for abrasive disks or cup emery wheels.

Sander, "Speed Bloc"

Sterling Products Co., 314 Curtis Bldg., Detroit Mich. (Vol.78,p.721) 332.

The "Speed-Bloc" sander weighs 7 lb., operates on compressed air at 70 lb., using 6 cu.. ft. per min., and can be used on metal surfaces. Travel of the



pad is 1¼ in. at 2,500 to 3,000 oscillations per min. The pad is made of rubber and felt and is bridged to be flexible. Thus, it is applicable to convex or concave surfaces.

Balancer for Portable Tools

Chicago Pneumatic Tool Co., 60 E. 44th St., New York, N. Y. (Vol. 78,p.816.) 388.

The "Super Safety" balancer for portable tools is made in seven sizes to handle loads from 30 to 200 lb. The construction eliminates sheaves and swivels. The up and down stopping point is regulated by a mechanically-operated geneva gear independent of the cable. In the event of spring breakage, the safety latch engages the teeth of the drum and prevents the load from dropping. Both hooks are of the closed-throat safety design. The top hook is laterally adjustable for centering the cable and load.

Screw Driver and Drill, Electric

Chicago Pneumatic Tool Co., 60 E. 44th St., New York, N. Y. (Vol.78,p.555) 228.

Both the No. 15N electric screw driver and the No. 14 electric drill operate on 3-phase, 180-cycle current at 220 volts. The No. 15N screw driver has a pistol grip. A positive jaw-clutch is built into the nose of the gear case. The model operating at free speed of 750 r.p.m. will drive a No. 6 screw or a $\frac{3}{16}$-in. nut. The weight is $5\frac{1}{4}$ lb., the length overall, $13\frac{3}{4}$ in.; spindle offset, $1\frac{1}{8}$ in., and the loaded speed, 675 r.p.m.

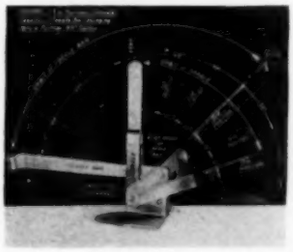
The No. 14 electric drill has a bonnet-type switch, and is made in three models, operating at free speeds of 2,800, 2,400 and 2,000 r.p.m., respectively. Drilling capacity in each case is $\frac{3}{8}$ in., the weight is $4\frac{1}{2}$ in., the length overall, 11 in.

Small Tools

Clamp, Toggle

Detroit Stamping Co., Detroit, Mich. (Vol.78,p.890.) 435.

The principle of the toggle clamp is that the handle and the clamping bar travel on two distinct orbits. Movement of the handle through 80 deg. on the clamp illustrated results in the bar moving through a 160 deg. arc. For 70 per cent of the travel of the handle, the

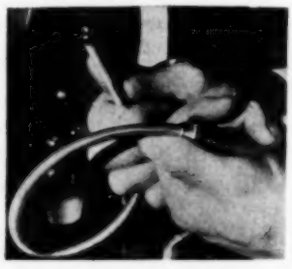


bar travels approximately three times as fast as the handle. From this point on, the handle travels increasingly faster than the bar. At the final 5 deg. of travel of the device it has a mechanical advantage of 12 to 1.

Nut-Holding Tool, "Flexi-Grip"

California Sales Co., 11 Front St., San Francisco, Calif. (Vol. 78,p.428.) 150.

For starting or removing nuts, bolts, cotter keys, rivets and other parts in inaccessible places and around corners, or in places too small for fingers or wrenches, a "Flexi-Grip" tool is being offered. Manufactured in 8, 12 and 18 in. sizes, this tool has claws that take a powerful grip on a nut or rivet, but add only $\frac{1}{16}$ in. to the cross-sectional diameter.



Plier, Fuse-Testing

Star Fuse Co., Inc., 235 Canal St., New York, N. Y. (Vol.78,p. 857.) 402.

The illustration shows the pliers testing across a switch for locating blown fuses. The tool is made of bakelite and

laminated fiber. It is insulated throughout. The testing indicator is a carbon lamp. Shocks are avoided as only one hand is used.

Spray Gun, Type MBC

DeVilbiss Co., Toledo, Ohio. (Vol.78,p.428.) 152.

Designed for production finishing operations, the Type MBC Spray Gun may be used with pressure, suction or gravity material feed. The air cap includes an increased number of openings, thus permitting better atomization of lacquers, primers, surfacers, sealers and ground coats. The spray width adjustment valve on the back of the gun is dialed to permit easy adjustment.

Spray Gun

H. D. B. Corp., 900 N. Spaulding Ave., Chicago, Ill. (Vol.78,p.554.) 232.

The No. 5 spray gun produces a highly atomized break-up of material, and yet the actual velocity of the spray is

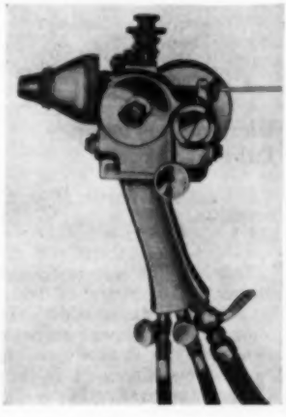
reduced so that a material, which has already been applied, and which is still wet, is not rippled.

Gun, "Metalspray"

Metal Spray Co., 113 Llewellyn St., Los Angeles, Calif. (Vol.78,p.552.) 238.

An improved "Metalspray" gun is available in two sizes. Models 81 and 126. Model 81 sprays all metals in 12-gage B & S size wire, weighs $3\frac{1}{4}$ lb. and produces a fine spray and a dense deposit. Model 126 sprays all metals in $\frac{1}{8}$-in. wire, sprays a dense deposit and is particularly suited for the heavy deposits necessary in building up machine parts. The weight is $3\frac{3}{4}$ lb.

In these spray guns the power plant is separated from the combustion unit. The rear

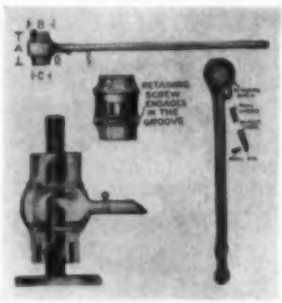


of the wire nozzle channel is open to the atmosphere and therefore gases cannot collect. Only the air caps which focus the air upon the molten wire are changed for the different metals. Knurled wire feeding wheels are located outside the gear case to obtain visible control and to prevent excessive wear from metal particles and scale on the wire. Turbine-air control valves and all other controls are placed on one side of the gun for easy operation. Individual valve controls are applied for acetylene, oxygen and air.

Wrench, Ratchet, Reversible

Greene, Tweed & Co., 109 Duane St., New York, N. Y. (Vol.78,p.425.) 168.

A stronger metal is being used for the handles, heads and pawls of the "Favorite" reversible racket wrench. In addition a regrouping has been effected of the handles and heads

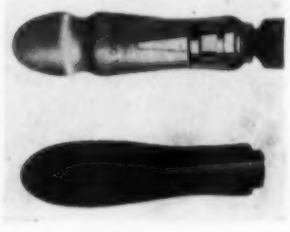


to avoid awkward combinations and duplications. A cadmium finish has been applied to improve the appearance and increase the weatherproof protection.

Handles, File and Tool

J. L. Osgood Machinery & Tool Co., Inc., 43-45 Pearl St., Buffalo, N. Y. (Vol.78,p.625.) 274.

A soft-grip handle has been introduced for use with files and other tools. The handle is furnished in the "Super-Strong" or "Junior" type of construction. In the former a long steel, double-flanged ferrule is forced into the interior of the handle. In the Junior construction a singlewall ferrule is employed, and in the interior an anti-split, shank-pressure resisting ring is fitted.



Gaging, Measuring and Testing Equipment

Dial Gage

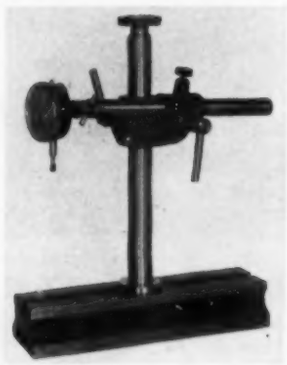
Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 392.) 138.

A dial gage No. 726-A is graduated to 0.0001 in. and equipped with jeweled bearings. The point of the gage is removable and points of different forms and lengths can be used. Dial face may be turned to bring the zero under the index pointer. The dial is 2 3/72 in. in diameter and has a 0.020 in. spindle movement. The lug on the back has a $\frac{3}{16}$ in. hole.

Dial Indicators

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 328.) 100.

The No. 731 and No. 731-A dial test indicators afford greater rigidity and accuracy in dial reading by using an upright and a dial-holding rod of larger diameter. The No. 731 indicator is furnished with a dial graduated to 0.001 in. and a spindle movement of 0.300 in.



The No. 731-A is recommended for uses where a higher degree of accuracy is required. It is furnished with a dial graduated to 0.0001 in., has jewel bearings, and the movement of the spindle is 0.020 in.

Dial Indicators

L. S. Starrett Co., Athol, Mass. (Vol.78,p.754.) 344.

A line of dial indicators is available in which stainless steel is used for the gears, rack, dowels, screws, stem, bushings, while the case and the bezel are chromium plated. The back is a solid die-casting, recessed to hold the clamping lug. Models available read in thousandths, half-thousandths, ten-thousandths, hundredths of a millimeter and five-hundredths of a millimeter, including gages that show both plus and minus measurements.

Gage, Small-Hole

Federal Products Corp., 1144 Eddy St., Providence, R. I. (Vol.78,p.653). 286.

Model 166 small-hole gage, which is a two-point contact, dial-micrometer plug gage, measures small diameters as well as detecting out-of-round, bell mouth and taper conditions.

Plugs can be furnished for any size from 0.200 up to and including 1½ in. The standard length range is from 2¾ to 5¾ in. Special lengths can be supplied for longer or shorter holes. The indicator is graduated in 0.0001 in. divisions.

Micrometer Head

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 687.) 300.

This 1-in. heavy micrometer head No. 296 is suitable for use with machines subjected to unusually severe requirements. It is used as an integral part of a

fixture, or by means of a clamp for making fine measurements and adjustments. Length of the shank is $\frac{13}{16}$ in. and the diameter is ½ in.

Micrometer Caliper, Tube

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 628.) 265.

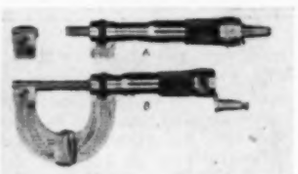
The No. 228 tube micrometer caliper has a range of from 0 to 1 in. by thousandths. This micrometer caliper accurately measures the thickness of tubing and pipe from $\frac{17}{32}$ in. inside diameter upward. The anvil is

rounded on the end and projects sufficiently from the frame to provide for easy measurements.

Micrometer Attachment

Henry O. Costello, 91 Raymond St., Providence, R. I. (Vol.78,p.886.) 425.

The quick-acting micrometer attachment is a sleeve adapted to be fitted over the knurled end of any standard micrometer, plain or ratchet type, for the purpose of securing quick rough adjustments. The attachment comprises a pivoted

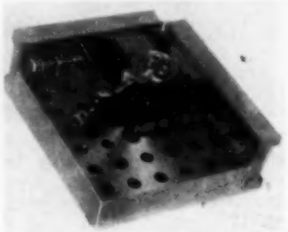


arm and combined operating and locking pin. The arm may be locked with the pin in axial alignment with the sleeve, as in *A*, or turned outwardly and held in eccentric relation with the axis of the micrometer, as in *B*, thus forming a quick-acting crank.

Angle Plate and Holocator

Dayton Rogers Mfg. Co., 1845 E. Franklin St., Minneapolis, Minn. (Vol.78,p.687.) 308.

The feature of this "Angle Plate and Holocator" is the employment of a precision ground bushing disk, of which three of different sizes are furnished. In conjunction with



the sets of gaging blocks, the bushing disk is used to make rectangular measurements quickly and accurately. After the work is laid out it is cross-checked with the vernier height gage. Capacity of the device is 5 by 6½ in.

Square, Surface-Plate

Brown & Sharpe Mfg. Co., Providence, R. I. (Vol.78,p. 753.) 352.

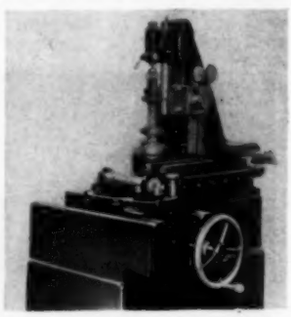
The square has both ends square with the sides and is of a form convenient for use as a

surface plate. The one-piece construction is not subject to changes from handling and from small variations in temperature. It is made of hardened steel 4 in. high and is approximately 3 in. between opposite edges.

Gear Checking Machine, Involute

Michigan Tool Co., 7171 Six Mile Road, Detroit, Mich. (Vol. 78,p.29.) 5.

A sine bar is employed on this involute checking machine to act as a compensator for the difference between the length of arc of 1 deg. on the friction disk that originates all of the machine movements and the length of arc of 1 deg. on the base circle of the gear being checked. The friction disk, which is integral with the work-holding spindle, imparts movements to the sine bar car-



riage. Angular setting of the sine bar controls the movement of the indicator head. The indicator head moves at right angles to the movement of the sine bar carriage so that the smaller the gear being checked in comparison to the friction disk, the smaller the angular setting required on the sine bar.

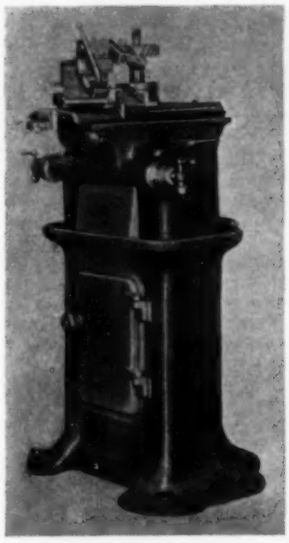
By the use of two indicators and a reversible indicator finger, both sides of a gear tooth may be checked without dismounting. Capacity is 4 in. in diameter by 12 in. in length.

Gear Testing Machine

Lees-Bradner Co., Cleveland, Ohio. (Vol.78,p.136.) 27.

Both spur and helical gears can be tested. This machine will check tooth contour, arc of action, length of line of action, tooth to tooth spacing, cumulative error and eccentricity. One attachment is supplied for testing tooth spacing and eccentricity, and another for testing show plus or minus variations to 0.0001 in.

The tooth curve of the gear is obtained by rolling a tangent

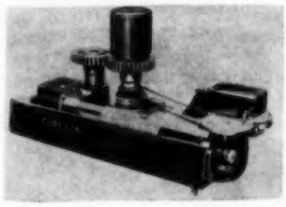


line upon the base circle and marking the path of any point in the tangent line. A contact lever is mounted with its contact surface intersecting the face of the straight edge. The straight edge is caused to roll upon the base circle and the contact lever traces the involute curve. Graduations on the cross-rail scale mark off a number of successive positions of the contact lever as it travels up from the base circle toward the tooth point, so that a record may be kept of the indicator readings.

Gear Testers, Universal "Parkson"

George Scherr Co., 128 Lafayette St., New York, N. Y. (Vol.78,p.265.) 87.

With these "Parkson" universal gear testers a test can be made under practically the same as operating conditions, and the test will quickly show whether a pair of gears will run silently and properly or not. These equipments are available in three different sizes as universal equipment for spur gears, spiral gears, bevel gears, as well as worm gears and worms. They may be used either with a dial indicator for quick visible



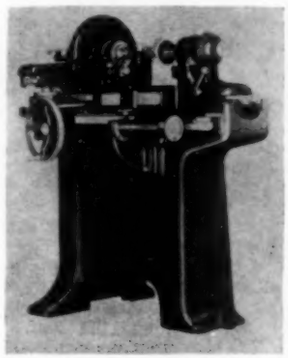
check or they can be equipped with a recording device.

The gears are tested in pairs. It is recommended that one of the pair be a templet gear. Both are mounted to revolve freely on arbors. One arbor is fixed in a carriage which is mounted on slide ways on the bed. The other arbor is carried by a floating carriage which has a limited movement longitudinally. Variations of the center distance or movements of the floating carriage caused by defects on the teeth or eccentricity with the bore may be noted on the indicator.

Testing Machine, Helical-Gear Lead

Lees-Bradner Co., Cleveland, Ohio. (Vol.78,p.264.) 89.

This machine not only measures the helix angle, or the lead, of helical gears, but in addition actually calibrates the machine settings. The method of measuring is one in which a point of contact with the gear tooth is moved across the gear face and at a uniform distance from the gear axis, while imparting to the gear being tested an angular or rotative motion equal in extent to one complete revolution while the contact point is moved through the exact distance of the



lead. Hence, when the lead is found to be correct the helix angles must be correct.

The gear is mounted between centers. An adjustable-tooth contactor, connected to a 0.0001-in. indicator, is mounted on a carriage at front. This carriage also carries an angularly adjustable straight-edge, and is traversed on the bed parallel to the head and tail-stock centers. The headstock spindle also carries a ground and calibrated involute cam. The headstock is further provided with a transverse cross-slide, one end of which mounts an adjustable roller that maintains contact with the involute cam. The other end of this cross-slide is provided with adjustable contact members that engage the straight-edge.

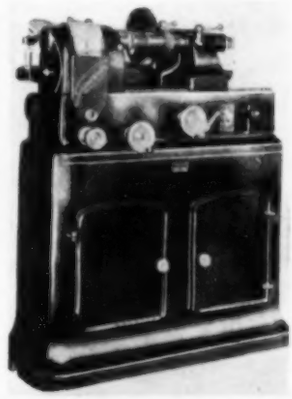
As the indicator carriage is traversed, carrying with it the angularly adjusted straight-edge, the transverse cross-slide carried by the headstock is caused to move at right angles to the work spindle. This movement causes the roller mounted on the cross-slide and in engagement with the involute cam to rotate the spindle and gear being tested. Thus straight-line motion of the indicator is converted into rotary motion of the spindle and gear.

Testing Machines, Gear

Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill. (Vol. 78,p.393.) 145.

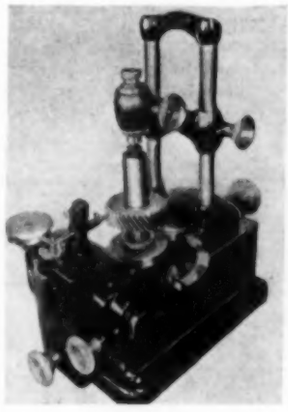
Three machines have been developed for inspection of gears. These units are as follows: The gear charting machine; the normal pitch and space measuring machine, and the involute profile measuring machine.

The gear charter shows combined errors of tooth profile,



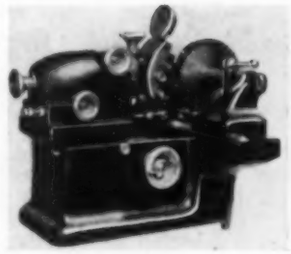
tooth spacing, interference and eccentricity. Also the gears can be set at correct center distance and rotational backlash measured with an indicator. After these various hand tests are made and each error observed, the gears may be rotated by power and a chart made which records the combined discrepancies.

The normal pitch and space measuring machine is designed



to measure normal pitch in the rotational plane of gears and to check spacing in various types of gears in planes other than rotational. It can be used for spur, helical, worm and bevel gears. This machine may be used on its own bed or it may be clamped to any machine that has a pair of centers.

Gears up to 10 in. in diameter, and those having shafts up to 13 in. between centers, are within the capacity of the involute profile measuring machine. Cluster gears and gears integral



on the shaft can be reached by moving the indicator slide to the desired position. A base circle must be made up for each different gear to be checked.

Testing Machine, Tensile and Bend, Portable

Air Reduction Sales Co., Lincoln Bldg., New York, N. Y. (Vol.78,p.426.) 163.

Essentially the machine consists of an oil pump, a hydraulically actuated piston or ram, two heads, one fixed and one removable, and four symmetrically located steel shafts, two of which transmit the piston motion and

load to the movable head. The load is indicated by a 6-in. pressure gage. A direct load of 40,000 lb. may be applied to specimens from 9½ to 10 in. long, up to ¼ in. wide.

Testing Machine, Hardness, Brinell

Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y. (Vol.78,p.521.) 214.

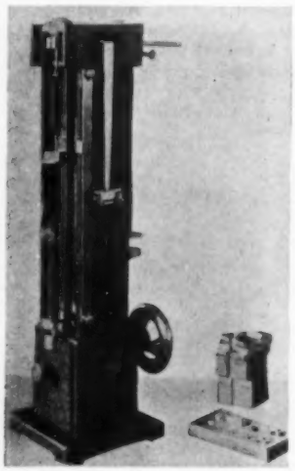
Materials ranging from lead to hardened steel can be tested for hardness with the Type M 60/750 portable Brinell testing outfit. This device is furnished with three sizes of steel balls. The designation of the instrument indicates the range in pressures in kilograms that can be used. The device is a tapered bar split to within ¾ in. of the

large end. On one surface at the large end is mounted a steel ball; on the opposite side a holder for use in vise, arbor press or toolpost. One prong holds the dial indicator, the other an adjustable screw to control dial indicator movement. Pressure is applied at the holder until prongs close, and dial indicator shows the position of screw corresponding to the pressure required.

Testing Machine, Spring

Coats Machine Tool Co., Inc., 110-112 W. 40th St., New York, N. Y. (Vol.78,p.330.) 121.

Type RS-5 machine combines a tensioning device with a scale for "weighing" the spring load and a graduated vertical length scale for measuring spring length. Specifications: Max-

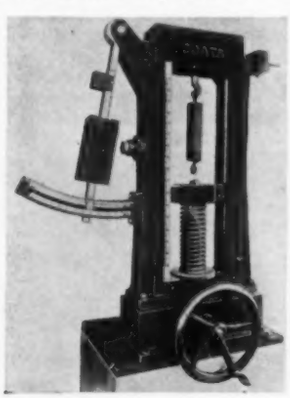


imum free length of compression springs, 12 in.; maximum extended length of extension springs, 12 in.; total height, 23 in.; weight, 46 lb.; normal load, 5 lb.

Testing Machine, Spring

Coats Machine Tool Co., 110 West 40th St., New York, N. Y. (Vol.78,p.586.) 226.

The Type DN "Elasticometer" spring testing machine is intended for heavy springs. The

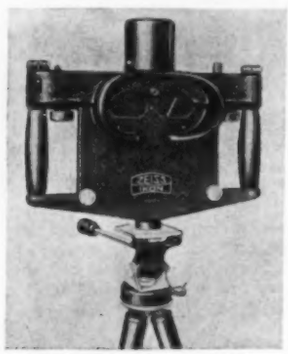


machine has no upper compression plate. A screw-operated crosshead bears down on compression springs, compressing them against a lower plate suspended from a single-beam weigher scale. For testing extension springs, a tension hook is provided that may be screwed into the cross-head. Four sizes of tester are built, the first having scale ranges of 0 to 150 and 0 to 650 lb., and the fourth size scale ranges of 0 to 1,000 lb.. and 0 to 6,000 lb.

Stroboscope, Zeiss-Ikon

Geo. Scherr Co., 128 Lafayette St., New York, N. Y. (Vol. 78,p.689.) 303.

In this stroboscope, of Zeiss-Ikon design, the part in motion is observed through a rotating slit disk, whose speed can be regulated and timed to coincide with that of the moving object. In this condition the stroboscope action is achieved and the ob-



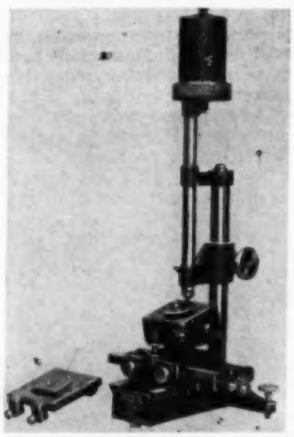
ject appears to be stationary, thus permitting its examination. The device may also be used as a tachometer, being equipped with a built-in speed indicator. The indicator permits measurement of any speed up to 140,000 r.p.m. by optical means.

Testing Instrument, Heat-Treatment

Greenlee Bros. & Co., Rockford, Ill. (Vol.78,p.363.) 120.

There has been developed the "Maximeter," an instrument, and "Maxipoint," its objective, a system of heat-treatment control and specification. This system was developed upon the assumption that the ideal draw temperature will leave a structure in which the hardness is just beginning to give way to ductility. The temperature of the draw, which leaves this dual condition, is the "Maxipoint."

The Maximeter stands about



30 in. high. It has a fixture for holding the test piece, a plunger, and a cylinder that contains a set of graduated weights.

The steel specimen is placed upon the anvil and the No. 8 and No. 1 weights permitted to fall. If there is complete hardness in this specimen, both weights will cause fracture. The specimen is then drawn to successively higher temperatures and tested until the four heavier weights will fracture the edge and the four lighter weights will cause only indentations. Then, "Maxipoint" has been reached.

Blueprint Equipment

Blueprint Machine

Shaw Blue Print Machine Co., 9-11 Campbell St., Newark, N. J. (Vol.78,p.425.) 157.

This Model E blueprint machine utilizes three General Electric vapor tube lamps. Tracings up to 42 in. in width by any length can be handled. A half cylinder of curved plate glass is bedded into the end frame castings and around this glass travels an endless canvas band. A ½-hp. motor drives the band and a variable-speed control gives speed variations of 6 in. per min. to 5 ft. per min. Blue prints, Van Dyke negatives, blue-line prints, black and white prints, or Ozalid prints can be made with this machine. Power consumption is 1,768 watts. A satin-finished aluminum reflector conserves the light from the three vapor tube lamps.

Blueprint Machine, Continuous

C. F. Pease Co., 813-821 N. Franklin St., Chicago, Ill. (Vol. 78,p.551.) 221.

A continuous blue-printing, washing and drying machine that produces blue prints at the rate of 12 ft. per min. has been developed. When equipped for making negatives this Model 11 machine will produce them at proportionately low cost.

Three units comprise the machine; a blue-printing machine, a

washing unit and a potashing and drying unit. The blue-printing machine can be operated independently from the other equipment by means of a clutch. Paper up to 42 in. wide can be handled. Power is furnished by a ¼-hp. motor, operating on 220 volts, d.c. or a.c. Either a gas- or electrically-heated dryer can be specified.

Blueprint Machine "Speedway"

F. A. Smith Mfg. Co., Inc., Rochester, N. Y. (Vol.78,p. 655.) 271.

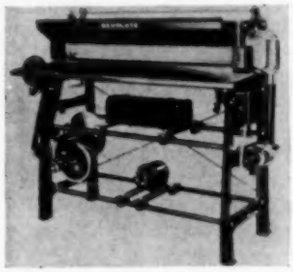
A blue printer has been developed for making blue prints of 9x12 in., or any intermediate size. The device will make one print per minute, the tracing and

blue print paper being fastened to the glass door. It can be obtained with a cabinet fitted with necessary developing and washing trays and with a print dryer.

Printing Machine, Photographic

Paragon-Revolute Corp., 77 South Ave., Rochester, N. Y. (Vol.78,p.489.) 193.

The No. 7 photographic printer will reproduce to the same size any one-sided copy that is semi-translucent. However, the principal use of the machine is to produce tracings of pencil drawings by means of a photographic process, utilizing



a sensitized translucent cloth. The No. 7 machine is provided with an adjustable aperture extending across the exposing area that can be varied from ⅛ to ⅞ in. in width. As the machine is used in a dark room, audible adjustments are provided. The speed of the revolving Pyrex cylinder may be varied from 4 in. to 20 linear ft. per min. Photographic prints made on the machine are developed, fixed and washed in a manner similar to photo-copy prints of ordinary snapshots.

Print Developing Machine

Ozalid Corp., 354 Fourth Ave., New York, N. Y. (Vol. 78,p.587.) 255.

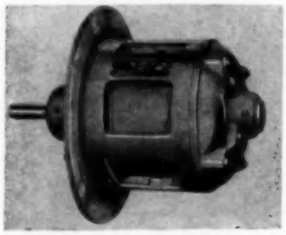
Using a dry developing process, this machine makes in one operation prints with blue lines on a white background to take pencil notations. Special sensitized paper is exposed through original tracings or prints on any standard printing machine and is passed through a vaporized ammonia bath.

Electrical Equipment

Motors, Flanged-Head

Louis Allis Co., Milwaukee, Wis. (Vol.78,p.426.) 139.

Several types of flanged-head mountings for electric motors are announced. Illustrated is a flange made as an integral part

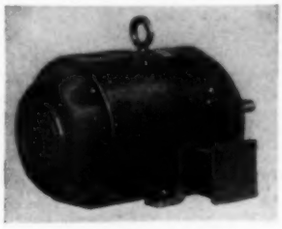


of the motor head, and this type may be finished on either or both sides. For use where feet on motor are undesirable.

Motors, Inclosed, Fan-Cooled, D. C.

General Electric Co., Schenectady, N. Y. (Vol.78,p.586.)

Totally inclosed, fan-cooled d.c. motors are now available in sizes from ½ to 200 hp. An internal fan draws the warm air from the windings and core and circulates it around the totally inclosed interior. An external fan draws cool air in through mesh openings in an outer end shield.



Motor, Self-Protected

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.267.) 68.

A protective device is built into the windings to shut off the current should the machine become stalled through overloading, excessively hot because of poor ventilation or run on single-phase. The sizes built range from ½ to 30 hp. in a.c. induction types for either 2- or 3-phases and standard commercial cycles and voltages. All of the controls are mounted in a housing on the motor.

Motors, Governor-Controlled

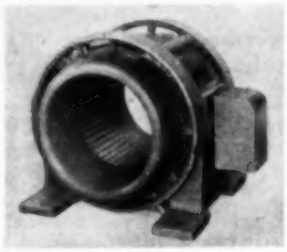
Bodine Electric Co., 2264 W. Ohio St., Chicago, Ill. (Vol. 78,p.814.) 346.

This line of electric-governor controlled motors is now available in larger sizes. The additional sizes range from 1/10 to ½ hp. Series and compensated-series types are built in an approximate speed range from 500 to 7,500 r.p.m. These motors are also available with built-in worm-gear speed reducers.

Motors, Squirrel-Cage

Allis-Chalmers Mfg. Co., Milwaukee, Wis. (Vol.78,p.817.)

"Seal-Clad" squirrel-cage motors have Bakelite shields sealed over the stator coils giving protection against dust and mois-

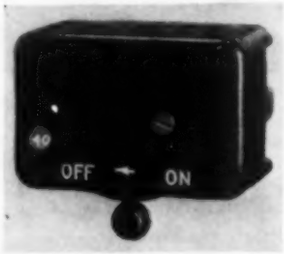


ture. Ratings to 25 hp., 1800 r.p.m. Oil and dust-tight sleeve bearings are used.

Circuit Breaker, Sentinel

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (Vol.78,p.456.) 112.

For the protection of fractional-horsepower motors, there are available single- and double-pole Type H sentinel breakers. They protect against burnouts that might be caused by low

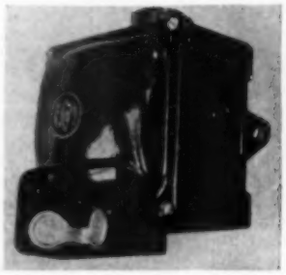


voltage, locked rotor or overload conditions. The breaker permits sufficient time delay to start small motors.

Pushbutton, Safety, Vapor-Proof

Electric Controller & Manufacturing Co., 2705 E. 79th St., Cleveland, Ohio. (Vol.78,p.235.)

This vapor-proof and dust-tight, safety lock-out pushbutton, known as the 270-A, Type J. Form C, is for 3-wire, low-



voltage protection of installations, where it is desired to start and stop a motor through its magnetically-operated starter or controller from two or more pushbutton control stations. The pushbutton may be locked in the "off" position at any one of the control stations.

Pushbutton, General-Purpose

Monitor Controller Co., Baltimore, Md. (Vol.78,p.361.) 99.

A Type 9000V pushbutton, is offered for machine tool applications and general-purpose use. The stop button is in a conspicuous position for quick accessibility, while the start but-

ton is in a protected place to prevent accidental pressure.

This type of station is available in single-, two- or three-button types.

Photo-Electric Controller, "Photo-Troller"

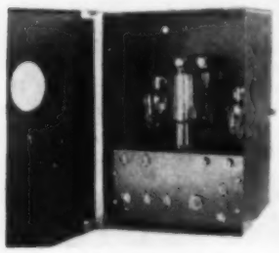
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (Vol.78,p.267.) 69.

The Type RK "Photo-Troller" is adapted to industrial light-sensitive applications requiring operation on low light intensity. The indoor model operates on three footcandles with the photo-tube extended at distances up to 10 ft. The unit will operate on as little as ½ footcandle with a pickup lens.

Relay, Photo-Electric

Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. (Vol. 78,p.362.) 90.

A much lower-priced photo-electric relay for general industrial use has been announced. The heavy-duty contactor in this "LE" relay interrupts 20 amp., 115 volts, a.c., non-inductive load, or 2 amp., 115 volts, d.c. In such applications as counting, the operating speed is fast, rang-

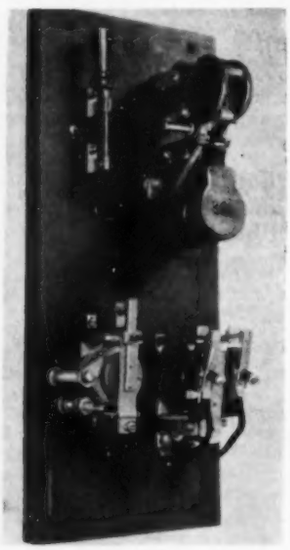


ing from 200 to 600 objects per minute and depending upon the amount of light change available and the resistance of the contacts. Gas or vacuum photo-tubes can be used.

Relay for Crane Operations

Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis. (Vol.78,p.267.) 77.

Increasing the lowering speed of the hoist drive without reducing the safety factor or minimizing the accuracy of control is claimed for this high-speed lowering relay. It is automatic and is controlled only by the weight of the load itself. When the load is heavier than about one-

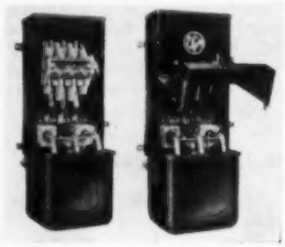


third capacity the relay automatically prevents the speed increase. This high-speed lowering relay can be applied to any d.-c. motor-operated crane equipped with a series motors and dynamic lowering control. It is available for any size of hoist motor operating on 110 to 550 volts.

Starter, Magnetic

Electric Controller & Mfg. Co., 2708 E. 79th St., Cleveland, Ohio. (Vol.78,p.170.) 42.

No. 2 Type ZOS oil-immersed, across-the-line, combination magnetic starter is offered for motors up to 30 hp., 220 volts; 60 hp., 440 volts, and 75

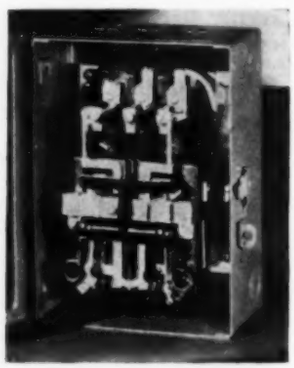


hp., 550 volts. An unfused or a fusible safety switch, a magnetic starter with overload relays and internal wiring are features.

Starter, Automatic, Solenoid-Type

Square D Co., Industrial Controller Div., Milwaukee, Wis. (Vol.78,p.170.) 43.

A solenoid-type automatic motor starter has a vertical, straight-line solenoid action and cannot be accidentally closed by vibration. Contacts are silver, double-break, and of high current-rupturing capacity. The starter is designated Class 8552,

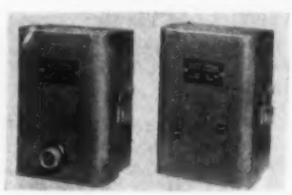


Type F, and has a maximum polyphase rating of 5 hp., 220 volts; 7½ hp., 440-550 volts. It is also built with a four-pole contactor for two-phase service.

Starters, Motor, Automatic

Lincoln Electric Co., Cleveland, Ohio. (Vol.78,p.656.) 278.

These starters are of the across-the-line type. It is impossible to close the starting

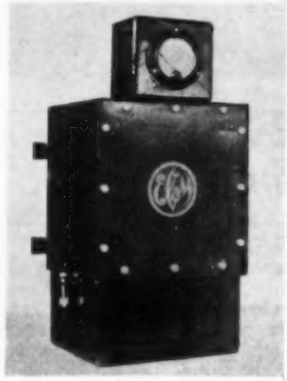


current unintentionally due to the design of the control. Once the motor is stopped, the only way it can be restarted is by pressing a recessed start button with the fingertip. Inverse time-limit protection allows carrying a small overload a long time or heavy load momentarily. The starters are furnished in three types for different horsepower and 110, 220, 440 ano 550 volts.

Starter, Motor

Electric Controller & Mfg. Co., E. 79th St., & Woodland Ave., Cleveland, Ohio. (Vol. 78,p.490.) 198.

A Type 20, weatherproof and dust-tight motor starter for across-the-line service is offered for motors up to 15 hp., 220



volts, and 30 hp., 440-550 volts. The starter is arranged for remote control, pushbutton, or automatic operation.

Starter, Motor, Fractional-Hp.

General Electric Co., Schenectady, N. Y. (Vol.78,p.722.) 290.

This compact starting switch is for use when hand-operated control at the motor is required and is intended for direct mounting on the built-in terminal box of standard G.E. fractional-horsepower motors. The switch is of the single-pole type, rated 6 amp. at 125 volts or 3 amp. at 250 volts. The specific motors on which the switch can be mounted include the Types KH, KC, RSA; Frames 42, 43, 44, 45, and 49.

Switch, Mercury

Hart Mfg. Co., Hartford, Conn. (Vol.78,p.427.) 153.

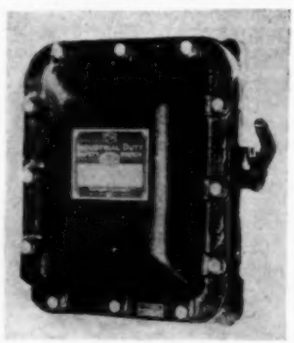
This switch is arranged so that the mercury tube can make or break the circuit by the action of the plunger in contact with cams, levers or gears on the machine. It is also used to control

motors that must be stopped during or after a machine operation, and as a limit switch for motor-operated mechanisms. The two sizes built are 10 amp., 125 volts, and 30 amp. 125 volts. The plunger may be omitted, and make and break effected by rocking movement.

Switches, Explosion-Proof

Cutler-Hammer, Inc., Milwaukee, Wis. (Vol.78,p.588.)

A line of explosion-proof safety switches for use in hazardous locations, including both the single-throw and double-throw types, is being made. The switch, is made in standard sizes

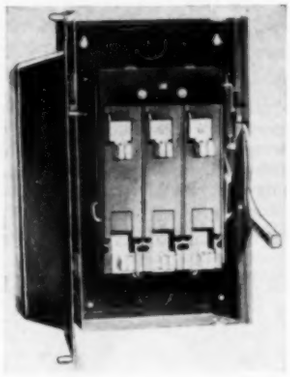


up to 200 amp. capacity. Two pipe-thread conduit holes are provided in the bottom of the case, and pads at the side and top of the case allow for drilling other holes.

Switches, 100- and 200-Amp.

Square D Company, Switch & Panel Div., Detroit, Mich. (Vol.78,p.722.) 289.

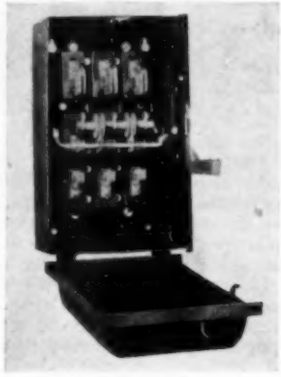
To the Square D 50,000 line have been added 100- and 200-amp. switches. These switches are quick-make, quick-break types with interlocked covers and elevated removable bases for easy wiring. The inclosures are small. Either standard sheet-metal boxes or cast aluminum inclosures are standard, and cast-iron inclosures are optional.



Switch, 30-Amp.

Square D Co., Switch & Panel Div., Detroit, Mich. (Vol.78,p.817.) 381.

A 30-amp. switch is available in 2- and 3-pole fused and unfused and 3- and 4-wire solid-



neutral models. It has an elevated, removable base for simplified wiring, and a front-operating handle.

Switch, Time

Paragon Electric Co., 407 S. Dearborn St., Chicago, Ill. (Vol.78,p.262.) 79.

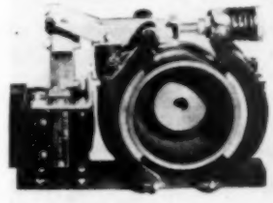
The Type G series switch is 8 in. high by 4 in. wide by 3 in. deep. It is a self-starting, synchronous type for use on any circuit not exceeding 1,600 watts. A skip trip provides for manually turning the circuit on

or off at any time ahead of the automatic setting without disturbing the normal sequence of operation. The switch is offered for a.c., single-pole, single throw; single-pole, double-throw, or any special two-circuit application.

Brakes, Electric, Small

Cutler-Hammer, Inc., Milwaukee, Wis. (Vol.78,p.654.)

Three sizes of small a.c. and d.c. solenoid-operated brakes have torque ratings ranging from 3 lb.-ft. to 75 lb.-ft. The brake wheel, which is relatively large, allows low total brake shoe pressures. This also results

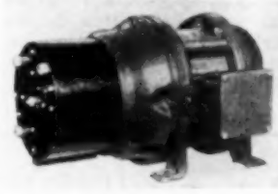


in low stresses on all pins and pivot points, and allows the use of a small operating solenoid, which requires less current.

Brake, Electric, Disk-Type

General Electric Co., Schenectady, N. Y. (Vol.78,p.811.)

This disk-type electric brake is intended for controlling small hoists, cranes, winches and similar equipment. It is suitable for applications requiring no more than 50 lb.-ft. braking torque on a continuous basis,

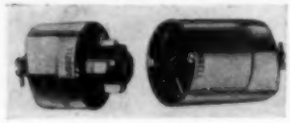


or 75 lb.-ft. on an intermittent basis. Braking pressure is applied whenever the motor power-supply is interrupted, by an adjustable, calibrated helical spring which forces the non-rotating disks against the rotating ones which are splined to the motor shaft.

Cord Connectors for Portable Tools

Harvey Hubbell, Inc., Bridgeport, Conn. (Vol.78,p.167.) 35.

The line of 4-wire polarized receptacles, cord connectors and caps, is designed for high-frequency portable tools. A positive locking feature prevents accidental breaking of the current, and polarization prevents insertion of the cap in any but the proper position. Grounding of the metal casings is positive.



Heater, Immersion

Harold E. Trent Co., 640 N. 54th St., Philadelphia, Pa. (Vol. 78,p.459.) 187.

Immersion heaters with a body length of 6 to 16 in., ratings of 500 to 2,500 watts, 115 or 230 volts, are being manufactured. These heaters are supplied with a body of seamless brass or copper fabricated from one length of tubing and welded into the head. The outlet box is removable and can be rotated to suit the position of the wiring.

Lamp, Mercury, High-Pressure

Westinghouse Lamp Co., East Pittsburgh, Pa. (Vol. 78,p.491.)

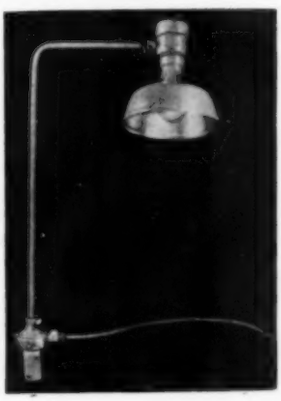
When the high-pressure mercury lamp is used in combination with standard tungsten-filament lamps, the combined light of these two sources is close to that of daylight in color. An

application of the high-pressure mercury lamp is the inspection of parts where the improved lighting permits ready detection of flaws.

Lighting Fixture, Industrial

Wuelker Reflector-Lighting Corp., San Francisco, Calif. (Vol.78,p.299.) 92.

The "Flexo-Dome" lighting fixture is for attachment to drill presses, lathes and other ma-



chine tools, is unaffected by motion or vibration, and is adjustable to any position. It is a jointed fixture having its own independent wiring system, equipped with socket and switch. An aluminum reflector and 150-watt bulb are supplied.

Lighting Fixture, Industrial

Wm. Edlich, Delawanna, N. J. (Vol.78,p.810.) 328.

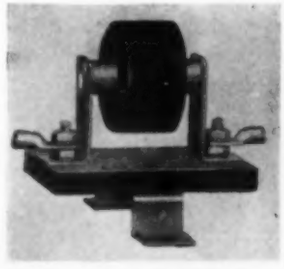
The "Foell" drop light can be readily adjusted close to the work in the machine. The parabolic reflector is supported by an endless chain which runs freely in the bead on the supporting shell above. The reflector can

be tilted to any angle, and will accommodate the usual size electric bulb for high intensity lighting directly on the work.

Resistors, Discharge

General Electric Co., Schenectady, N. Y. (Vol.78,p.523.) 217.

To protect the insulation of d.c. magnetic circuits against discharge voltages when the circuits are opened, a "Thyrite" discharge resistor has been introduced. "Thyrite" is a non-porous, inorganic, ceramic material as hard as marble. It



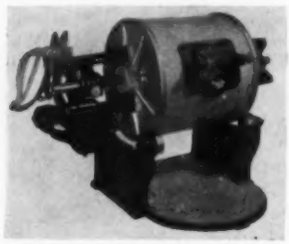
conducts about sixteen times more current each time the voltage is doubled, and easily takes care of discharge voltages and current flow. Designated as Type CR9196, "Thyrite" discharge resistors are available in two ratings—one for 110 to 275 volts, and the other for 500 to 650 volts. At line voltages "Thyrite" is an insulator and reduces the continuous power loss to 2 per cent of that for permanently connected fixed resistors. It acts on the same principle as the lightning arrester.

Furnaces and Equipment

Furnace, Electric, Melting

Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich. (Vol.78,p.235.) 56.

A rocking electric furnace of 25 to 100 lb. capacity has been designed for production or experimental melting of small-lot runs of such metals, as iron, alloy steel, copper, brass, nickel,

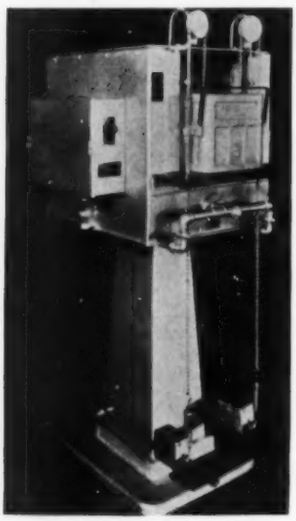


aluminum or precious metals. It is completely equipped with transformer, control panel, switches, meters and rocking mechanism. Nominal rating, 20 kw.

Furnace, Electric

Sentry Co., Foxboro, Mass. (Vol.78,p.360.) 122.

Two methods of maintaining proper furnace atmosphere can be used with the Model "W" electric furnace. The company's "Diamond Block" method can be used to produce an atmosphere containing in excess of 25 per cent carbon monoxide for the purpose of hardening

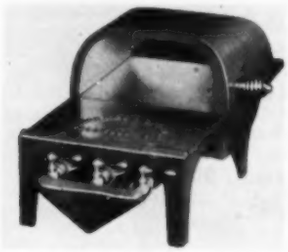


small tools. A licensed gas curtain can also be used to give an atmosphere containing approximately 12 per cent carbon monoxide. Automatic temperature control is supplied to maintain the furnace temperature at plus or minus 10 deg. F. of setting, when operating at any temperature between 1,000 and 2,600 deg. F.

Furnace, Gas, Bench

Red Devil Mfg. Co., Bellwood, Ill. (Vol.78,p.327.) 95.

In the three-burner gas bench furnace, designated as No. 30, a temperature of 1,800 deg. F. can be secured in the firebox without a blower. Dimensions: length, 16½ in.; height, 8 in.; width, 7½ in. Firebox size, 6½x6½x5 in.

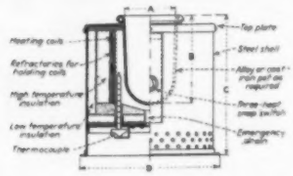


Net weight, 20 lb. Gas consumption, 15 cu.ft. each burner per hour.

Furnaces, Pot, Improved

Hevi-Duty Electric Co., Milwaukee, Wis. (Vol.78,p.524.) 206.

An improved line of round-pot and rectangular-pot furnaces for lead, salt, babbitt and similar materials has been marketed. The round-pot furnace illustrated has a top plate of ribbed, alloy cast iron. Insulation consists of high and low temperature slab material. Heat-

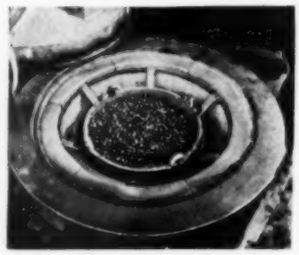


ing elements of the helical-coil type are of nickel-chromium wire and are mounted in radiant refractories. A three-heat snap-switch is supplied on all sizes. Pots are available in various metals for heat-treating or melting operations.

Pot, Tempering, for Dense Loads

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. (Vol.78,p.424.) 164.

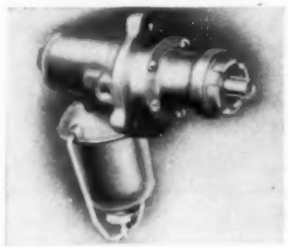
The "Homo" furnace is designed for heating dense loads of parts such as rivets, bolts and other small parts. Heated air is pulled through the work at high speed to heat all parts, at middle, top and sides, to the same temperature. Just before the work reaches the soaking temperature, two-thirds of the power input is cut off automatically to prevent overshooting. At this point a "Micromax" automatic controller takes charge of the operation. The length of soak can be varied, and the temperature can be raised or lowered quickly.



Fuel Pump, Automatic

Sundstrand Machine Tool Co., Rockford, Ill. (Vol.78,p. 490.) 201.

For use in connection with heat-treating furnaces, this automatic fuel pump is suitable for all small capacity applications where oil heat is being used. The unit consists of a variable-displacement pump and a



strainer, the pump automatically taking care of the work done by valves, thus entirely eliminating all valve mechanism. The pump discharges with no by-passing only as many gallons of fuel per hour as is determined by the nozzle size. Automatic air release or air bleed is incorporated.

Pyrometers

Russell Electric Co., 352 W. Huron St., Chicago, Ill. (Vol. 78,p.328.) 75.

"Hold-Heat" pyrometer is designed for comparatively large current flow. It has a steady movement, together with strong control springs, that makes the meter practically dead-beat. Different thermocouples used

with the instrument have nearly the same electrical resistances.

Valve, Micro-Regulating

Hauck Mfg. Co., 126-134 Tenth St., Brooklyn, N. Y. (Vol.78,p.491.) 199.

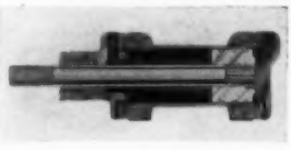
This valve is suitable for high or low pressure burners. All grades of oil can be used. The ring seat has a triangular-shaped opening in the side, whereas the cup-shaped valve plug has a rectangular slot, at right angles to the opening in the seat. Flow depends upon the position of the rotating valve in relation to the triangular slot in the ring seat.

Hydraulic Equipment

Cylinder, Hydraulic

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill. (Vol.78,p.889.) 438.

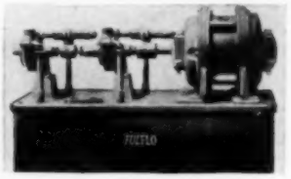
A line of double-acting cylinders for high-pressure hydraulic service has been developed. Numerous types and sizes are built. Practically any length of stroke can be furnished. The standard models are designed for pressures up to 1,500 lb. per sq.in. A feature of this cylinder is the fact that tie-rods have been dispensed with, thus enhancing the appearance and further preventing leakage.



Power Unit, Hydraulic, "Fulflo"

Fulflo Specialties Co., Inc., Blanchester, Ohio. (Vol.78,p. 458.) 182.

This hydraulic power unit consists of a motor, tank and two "Fulflo" spiral-gear pumps.

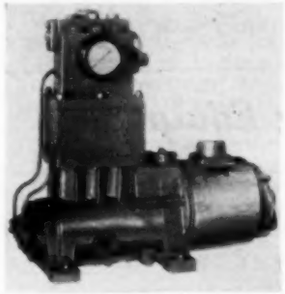


Dual control makes possible two separately controlled hydraulic movements. Separate relief valves provide for by-passing so that the oil pressure required can be maintained in each pump.

Power Unit, Hydraulic, "Triplex"

Kobe, Inc., Huntington Park, Calif. (Vol.78,p.135.) 25.

The self-contained hydraulic "Triplex" power unit is available in 3-, 7½- and 15-hp. sizes, displacements of 1 to 12½ g.p.m., for continuous duty at pressures from 500 to 5,000 lb. per sq.in. Pump drive and motor are completely self-contained and in-

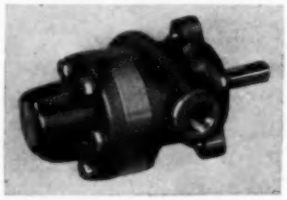


closed. Lubrication oil and the hydraulic medium are maintained separately. The plungers are of the packless type and slippage is returned to the supply. Plungers, cylinder liners, valves and valve seats are replaceable. The overall unit efficiency is approximately 80 per cent.

Pump, Hydraulic, "Rota-Roll"

Sundstrand Machine Tool Co., Rockford, Ill. (Vol.78,p.31.) 8.

A small-capacity, high-pressure rotary pump has been added to the "Rota-Roll" line. Pumping members comprise a rotor and roller that revolve with each other in a manner



similar to a single roller when rolling with the outer race of a roller bearing. It is built to run at motor speeds and is available in two sizes, the capacities being 1 and 2 g.p.m. at 1,725 r.p.m.

Pump and Fluid Motor, Gear-Type

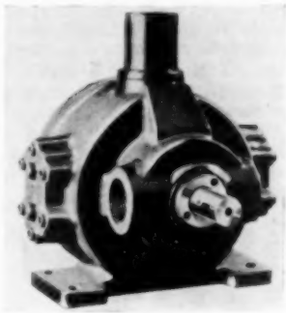
Vickers, Inc. Detroit, Mich. (Vol.78,p.168.) 33.

A balanced gear pump and fluid motor has been developed. When used as a motor the unit can be started under full pressure and it has full torque when stalled. Also, the unit may be used a pump or motor and rotation is reversible without internal changes. It has operated at pressures up to 1,500 lb. per sq.in.

Pump, Hydraulic, Variable-Volume

Racine Tool & Machine Co., Racine, Wis. (Vol.78,p.784.)

Pressures to 500 lb. per sq.in. and momentary pressures up to 1,000 lb. per sq.in. may be delivered with this variable-volume hydraulic pump. It is available in three sizes, with out put to 2,000, 4,000 and 6,000



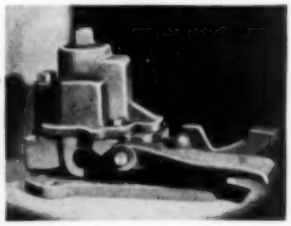
cubic in. per min. These sizes are all furnished in one size of pump case.

Pumps are the multiple-vane type, having thirteen vanes, which when revolved at 1,200 r.p.m. provide 15,600 impulses per min. to insure smooth operation. The volume is controlled by offsetting the governor ring or pumping chamber mechanically or automatically.

Valve, Spool-Type, Foot-Operated

Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. (Vol.78,p.586.) 239.

This spool-type foot-operated valve is for either three-way or four-way distribution. The spool moves $\frac{7}{16}$ in. for a full

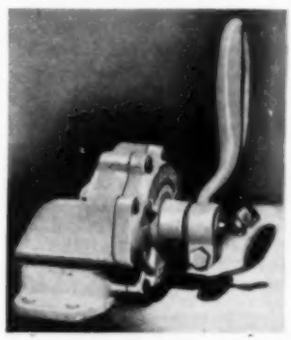


reversal of fluid distribution, and the pedal moves through an angle of only 10 deg. A latch is combined with the pedal to hold it down until unlatched by the foot. By removal of a pin, the latch is made inoperative. All connection openings are near the floor where they will present the least obstruction.

Valve, Manifold

Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. (Vol.78,p.426.) 158.

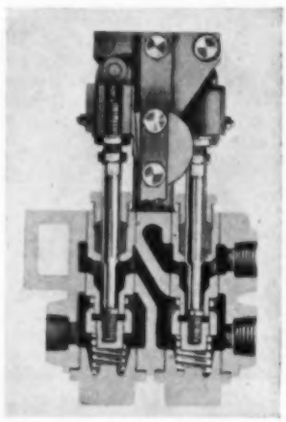
This manifold valve is particularly adaptable to installations where a number of valves must be located close together. Between reversals, the valve disk rotates on two eccentric points while in contact with its seat. Circular lines of contact or scoring do not develop.



Valves, Hydraulic, Protected-Seat

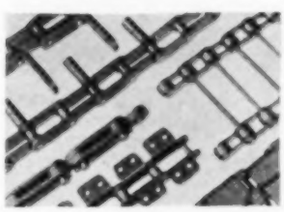
Homestead Valve Mfg. Co., Coraopolis, Pa. (Vol.78,p.428.)

As the valve stem moves down with the closing of the valve, practically all flow of water is cut off by a closely fitted sleeve around the seat and a closely fitted plunger inside



the neck of the seat or seat bushing. Consequently, the seating elements make contact with practically no water flow and the result is lower maintenance. Valves are built in three-way and four-way types, and are suitable for controlling single- or double-acting pistons.

Material Handling Equipment



Chains, Conveyor

Whitney Mfg. Co. Hartford, Conn. (Vol.78,p.654.) 267.

Chains are made in two series with standard and oversize rolls and both in four different sizes. The chain utilizes the standard roller chain construction with an extended pitch. Series 500 and 550 chains operate over sprockets, but the use of a large diameter roll on the 550 series allows it to be used as a drag or pressure chain.

Pitches are 1½, 2, 2½ and 3 in.

Hoist, Chain

Wright Mfg. Div., American Chain Co., Inc., York, Pa. (Vol.78,p.457.) 117.

A zinc coating is used on all exposed parts, making the hoist

practicable for outdoor use. The addition of precision ball bearings increases the efficiency by 10 per cent.

Switch, Tramrail, Sliding

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio. (Vol. 78,p.169.) 16.

A tramrail sliding switch is said to have the following features: Minimizes the necessity

for superstructure; fewer supporting fittings; eliminates bending and fitting curves to the switch; eliminates angular rail cuts; positive latching; easier rolling carriage. The switch is built in capacities up to 3 tons. Both Osborn "Teerail" and "Beamrail" with standard jigdrilled ends can be fitted to the switch.

Tractor, Industrial

Clark Trucktractor Co., Battle Creek, Mich. (Vol.78,p.858.)

The "Clarktor-6" industrial tractor is equipped with a 46 hp., 6-cylinder power plant. Heavy-duty transmission and special gear ratios in the double-

reduction rear axle make speeds as high as 18 m.p.h. available. All models have a self-starter, generator, battery, horn, bumper plate, eye coupler and pneumatic tires.

Truck, Die, 25-Ton

Elwell-Parker Electric Co., Cleveland, Ohio. (Vol.78,p.200.) 51.

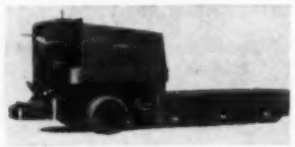
A 25-ton body die truck has been furnished. The hoist deck consists of two longitudinal channels, laterally braced, and the whole covered with a heavy plate. Elevator pillars are 12-in. wide, solid steel bars and arranged to present wide surfaces

for double carrier rollers to bear against. A U-shaped plate ties the uprights together across the angles and face. A ½-in. plow steel cable is connected to the elevator carriage. A separate motor-driven hoist drum lifts the 25-ton load. Each of the four trail wheels is equipped with two 18 x 21-in. solid-rubber tires to distribute the load over the largest possible floor area.

Truck, Dies, Electric

Automatic Transportation Co., 101 W. 87th St., Chicago, Ill. (Vol.78,p.684.) 298.

Large automobile body dies weighing over 30 tons can be transported to and from the press by the electric truck illustrated. The load platform does not exceed 40 in. wide, 96 in.



long and 17 in. high, and is thus capable of entering the skids on which the heavy dies are mounted. The vertical lift elevates the skid 4½ in. from the floor.

Truck, Lift, Gas-Operated

Elwell-Parker Electric Co., Cleveland, Ohio. (Vol.78,p.459.) 185.

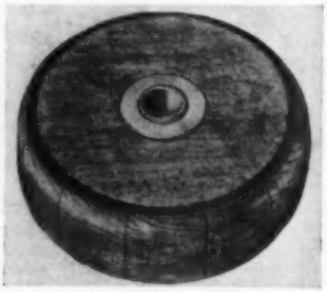
This 3-ton, gas-operated, industrial lift truck has two speeds forward and two reverse. A single pedal controls both the brake and the clutch. Pressing down the pedal releases the brake and engages the clutch.

Releasing the pedal automatically disengages the clutch and then applies the brakes. An hydraulic hoist mechanism elevates the platform which is mounted on rocking links.

Wheels, Truck and Caster, Light-Duty

Metzger Co., Inc., Grand Rapids, Mich. (Vol.78,p.267.)

These wheels are built up of a number of hard maple wedges. Diameters range from 2½ to 10 in. inclusive. Any thickness



of face, hub-length and bore for the axle can be supplied without extra charge. Wheels within this range of sizes can be supplied for standard axles fitted with ball bearings at a slight additional charge.

Truck, Lift, for Tin Plate

Barret-Cravens Co., 3255 W. 30th St., Chicago, Ill. (Vol.78, p.786.) 355.

A lift truck has been developed for handling the new low 4-in. high skids on which tin plate is being shipped. The truck, in addition to having single lift, compound lift and angle lift, is only 3½ in. high in the lowered position. It is 15 in.

wide, has a carrying frame 24 in. long, and a clearance between the forks of 5 in. It is capable of lifting loads to 3,500 lb.

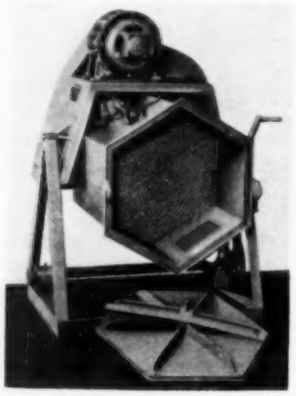
Parts Cleaning Equipment

Barrel, Burnishing

N. Ranschoff, Inc., Cincinnati, Ohio. (Vol.78,p.885.) 406.

The barrel may be charged with large work by removing the barrel head. Small work is loaded through the small door. The hexagonal burnishing compartment is 12 in. deep and measures 24 in. side to side.

When the barrel is loaded it is tilted 5 deg. below horizontal, and is rotated. This causes the



balls from the compartment in the rear to move to the burnishing section. When burnishing is completed a turn of the crank tilts the barrel to 10 or 15 deg. above horizontal and rotation is reversed. This causes the balls to sift out of the work through the perforated plate.

Barrels, Tumbling, Tilting

Globe Machine & Stamping Co., 1200-1250 W. 78th St., Cleveland, Ohio. (Vol.78,p. 395.) 125.

A redesigned line of tilting-type tumbling barrels now consists of five sizes. The "Work Shifting" bottom is a one-piece

casting that fits into the bottom of the shell and forces the load to move forward and backward. Since the load is also rotated constantly, the triple action affords greater speed and uniformity of finish. A redesigned base, stand, gear guard, pulleys, and shifter bracket increase the rigidity for the machine.

Cleaning Machine, Blast, Centrifugal, Type GI

Pangborn Corp., Hagerstown, Md. (Vol.78,p.889.) 432.

This Type GI centrifugal blast-cleaning machine cleans loads up to 18 cu.ft. in bulk and

averaging 2,200 lb. in weight, in times which vary from 7 to 15 min. The action of two revolving drums throws the castings onto a center strip directly under the abrasive stream created by a revolving wheel. In this manner each casting is cleaned. The loading door is opened and closed by a quick-acting cylinder. An electric time clock automatically operates a warning signal when cleaning is completed.

Washing Machine, Casting

Pangborn Corp., Hagerstown, Md. (Vol.78,p.167.) 41.

Equipment for washing castings is being built utilizing water at 300 to 400 lb. per sq.in. This equipment is designed to clean steel castings ranging in size from small gears to large revolving frames weighing 15 tons. The washer consists of a steel room 25 ft. square on the inside and having an over-all height from the floor level of 17 ft. 9 in. Two front doors are

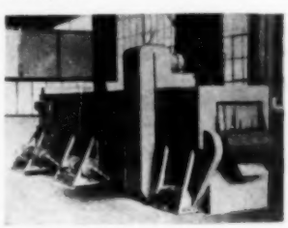
operated by hydraulic cylinders and provide an opening 15 ft. wide and 16 ft. high for moving castings in and out of the room. An opening in the top permits the use of a traveling crane to place the work on a 12-ft. turntable in the center. Turntable capacity is 50 tons and it is rotated in either direction by a 10-hp. waterproof motor. Two operating stations are located at one corner of the room.

Washing Machine for Metal Parts, Continuous

N. Ransohoff, Inc., Cincinnati, Ohio. (Vol.78,p.656.) 282.

Stampings, castings, forgings or machined parts enter this continuous-type washing machine from a belt or chute and travel through the equipment on an endless woven-wire conveyor at the rate of 20 ft. per min.

Five operations are involved in cleaning the parts—a wash, drain, rinse, second drain and drying. Four motors drive wash pump, rinse pump, blower and conveyor.

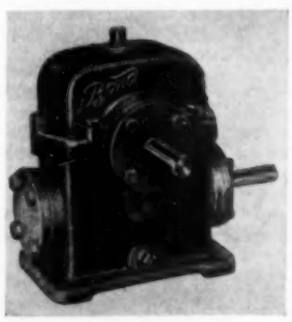


Transmission Equipment

Speed Reducers, Worm-Gear

Charles Bond Co., 617 Arch St., Philadelphia, Pa. (Vol.78, p.481.) 184.

Type K horizontal reducer; ratios 7½ to 1 to 48 to 1 in 4 sizes; motor sizes ⅛ to ½ hp. Type M horizontal unit: ratios 5, 10 and 20 to 1, input, ⅛ hp. Type PM, similar, but not for continuous service. Type PR is also similar, but has double-



ended worm wheel shaft. Type B horizontal illustrated: output 0.90 to 5 hp. at 1800 r.p.m., and made in large number of ratios and sizes. The Q unit has the worm below the wheel; sizes ⅛ to ½ hp. DN units are double-reduction; ratios 35 to 1, to 400 to 1, with 1/30 hp.

Speed Reducer, Motorized, "Planigressive"

Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis. (Vol.78,p.29.) 10.

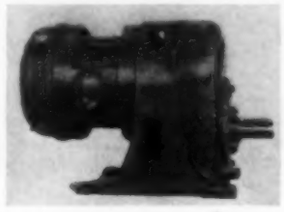
This device gives a variation in speed and also a reduction in speed. Reduction in speed is obtained through planetary gears. The reducer can be run in either

direction without making a change or adjustment. A standard NEMA frame motor is used to drive the reducer. Sizes range from ¾ to 10 hp. Ratios from 3 to 1, to 10 to 1.

Speed Reducers, Motorized, Type "S"

Reliance Electric & Engineering Co., 1042 Ivanhoe Rd., Cleveland, Ohio. (Vol.78,p. 263.) 59.

Single-reduction gearmotors in ratios up to 6 to 1 inclusive are



now available. These gearmotors can be furnished with a.c. or d.c. motors of various types in sizes from ¾ hp. and up. Multi-speed and adjustable-speed motors may be used. The entire reduction is obtained in a single pair of gears.

Speed Reducers, Motorized, Horizontal and Upright

Sterling Electric Motors, Inc., Telegraph Rd. & Atlantic Blvd., Los Angeles, Calif. (Vol.78,p. 391.) 142.

"Vari-Speed" motors are built in horizontal and upright designs. The horizontal models are available in open and closed types, whereas the upright type is made in the closed design only. Both closed models are available in ratings up to 15 hp. Standard variations are 2-to-1, 3-to-1 and 4-to-1, and these can

be set so that any portion of the variation may be used. Open-type horizontal models are made in sizes up to 25 hp., and pulleys give a standard variation of 2-to-1 and 3-to-1. "Vari-Speed" motors can have slow speeds (down to 5 r.p.m.) or with increasers, giving very high speeds (up to 15,000 r.p.m.).

Speed Reducers, Motorized and Plain

Boston Gear Works, Inc., North Quincy, Mass. (Vol.78, p.887.) 426.

Five motorized speed reducers and one plain speed reducer have been developed. Fig. 1.

Type MA horizontal reducer; single reduction; right-angle worm drive; ⅛-, ¼- or ½-hp. a.c. or d.c. motor; Ratios from 3¾ to 1 up to 48 to 1.

Fig. 2. Type CMA horizontal reducer; commpound reduction; right-angle gear drive; ½-hp. a.c. or d.c. motor; ratios up to 5000 to 1.

Fig. 3. Type VMA vertical reducer; single reduction; right-angle worm drive; ratios from 3¾ to 1 up to 48 to 1.

Fig. 4. Type CVMA vertical reducer; compound reduction; right-angle gear drive; ½-hp. a.c. or d.c. motor; ratios up to 5000 to 1.

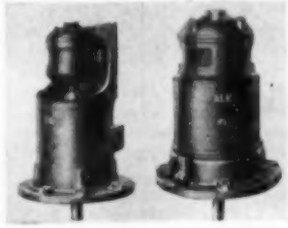
Fig. 5. Type IMA inverted-type reducer; single-reduction; right-angle gear drive; ⅛, ¼, or ½ hp. motor; ratios from 3¾ to 1 up to 48 to 1.

Fig. 6. Type LD parallel-shaft, plain speed reducer; double reduction; worm drive; ratios from 37½ to 1 up to 1740 to 1.

Speed Reducers, Motorized, Vertical

Falk Corp., Milwaukee, Wis. (Vol.78,p.490.) 189.

A line of vertical "Motoreducers" comprising the Types IX, ZX and LX, is available in sizes from ¾ to 75 hp., and 1,750 r.p.m motors are considered standard. The Type IX is for double or triple reduction, and corresponds to the figure shown at the right of the accompanying illustration. One motor end bell is removed and the stator is close coupled through an adapter to the gear

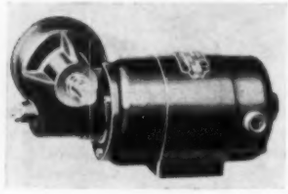


case. The Type XZ uses any standard horizontal, ball-bearing type motor with feet, with resilient connection through Falk Bibby coupling to the gearing. The Type LX, not shown, is for single reduction only (1.5 to 9.0) and corresponds to the company's Geared-Head "L" horizontal motoreducer.

Speed Reducer, Motorized

Dumore Co., Racine, Wis. (Vol.78,p.817.) 335.

Type K3-M 1/7-hp. motor with a built-in speed reducer. The single gear reduction unit can be supplied in three ratios—5 to 1, 14½ to 1 and 34 to 1,



giving shaft speeds of 1,300, 448 and 191 r.p.m. The gear unit can be positioned so that the gear shaft projects at any desired angle.

Speed Reducer, Motorized, Eight-Speed

Century Electric Co., St. Louis, Mo. (Vol.78,p.784.) 375.

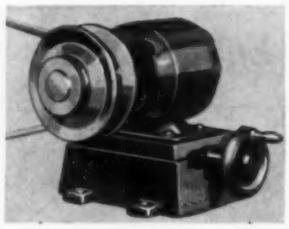
Eight speeds are obtained by combining a four-speed motor and a two-speed gear unit. Two, four and six-speed gear motors are also available. The motor may be wound for eight

single-, two- or three-phase power. These gear motors make use of a standard, horizontal ball-bearing motor. A resilient coupling is used between the motor and the gear unit.

Pulley, Variable-Speed

Winfied H. Smith, Inc., Springville, Erie Co., N. Y. (Vol.78,p.201.) 54.

This variable-speed pulley consists of two conical sections or two half pulleys. These half pulleys have slots on their faces, permitting them to give a positive drive effect. Each half pulley is mounted on a bushing having a spiral key which engages with a spiral groove in the bore. The bushing is keyed to the motor shaft. As the base of the motor moves back and forth, the two half pulleys will



move together or will separate, causing the belt to run on a smaller or larger diameter of the pulley.

Transmission, Variable-Speed

Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill. (Vol. 78,p.360.) 108.

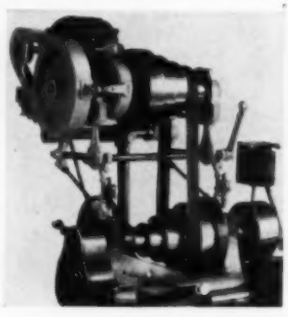
A self-adjusting, positive, variable-speed transmission for fractional-horsepower duty, known as the "V.R.D.," is announced. The unit is capable of an output of ¼ hp. at maximum speed, with a maximum ratio of speed variation of 10 to 1. The chain is a side-contact roller type consisting of steel links. Openings in each pitch

of the links provide a pocket for each of two hardened steel rollers. Each pair of chain rollers, at each engagement of chain and wheels, rolls into contact with hardened-steel conical opposed disks forming the driver and driven wheels. The chain is engaged positively in the wedged-shaped wheels at the proper pitch line for the speed desired on the output shaft. A speed indicator is provided.

Countershaft, Motorized, "Remco"

Manley Products Corp., York, Pa. (Vol.78,p.492.) 209.

"Remco" motor drives have been developed for lathes, drill presses, milling machines, shapers, and miscellaneous ma-

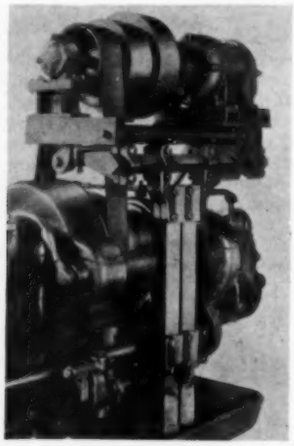


chines. Illustrated is a front view of one of these drives applied to a lathe. The original countershaft cone pulley may be salvaged, and the proper countershaft speed is obtained through a reduction from the motor. Primary drive is obtained by silent or roller chains. The entire driving mechanism is balanced on a rocker shaft carried in a horizontal bearing at the top of the main column. Eccentrics at the front allow rocking the entire drive up or down to obtain slack in the belt when it is desired to change speeds.

Countershaft, Motorized

Production Engineering Co., 5219 Windsor Ave., Cleveland, Ohio. (Vol.78,p.328.) 93.

Type 844 motorized countershaft is being offered for motorizing machine tools. The unit is built with anti-friction bearings throughout and it is easily installed. Four bolts and a short belt cover the necessary requirements. The drive is complete with a ball-bearing motor

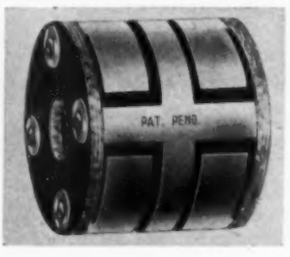


and reversing drum switch ready for mounting on the machine. The accompanying illustration shows a drive on a screw machine.

Coupling, Flexible

Baldor Electric Co., 4357 Duncan St., St. Louis, Mo. (Vol.78,p.263.) 64

The "Flex-Align" coupling is designed to take care of large misalignments and to absorb vibration Special rubberized faric driving members are employed. The motor may be



coupled so close to the driven appliance that the shaft ends almost touch. Each part is held to the shaft with two setscrews placed at 90 deg. The coupling will run in either direction without backlash. Three sizes are for 1/3, 1 and 3 hp., at 1,725 r.p.m.

Coupling, Torque-Ring, Waldron

Smith & Serrell, 30 Washington Place, Newark, N. J. (Vol. 78,p.233.) 52.

An all-steel lubricated gear-type coupling known as the "Waldron Torque Ring Coupling" has been developed. When the connector shafts become misaligned there are four points within the coupling at which

relative movement can take place. Each torque ring (2) can tilt and can slide endwise with respect to its hub member (1), and the torque rings and hubs can also tilt and can move endwise within the single piece cover sleeve (3). Fifteen sizes are listed, 1⅞ to 12 in. shaft sizes. Ratings 22½ to 4,840 hp. per 100 r.p.m.

Couplings, Flexible

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. (Vol. 78,p.425.) 166.

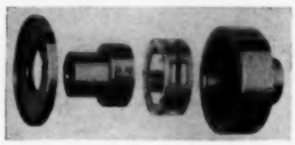
The Type WH coupling consists of two cast-steel flanged halves, two sheet-steel cover plates, two snap or retaining rings and from five to twenty-two flexible elements, depending on size. The cushioning elements are subjected only to compression under load. The

flexible elements can be removed and replaced without disturbing the coupling flanges. The coupling can be used for speeds up to 8,000 ft. per min. Horsepower ratings are 1.87 to 1,870 hp. per 100 r.p.m. Shaft diameters range from 1 to 10 in., and weights from 6 to 3,115 lb.

Clutch, Over-Running

Hilliard Corp., Elmira, N. Y. (Vol.78,p.329.) 103.

The ratings of this over-running clutch range from ¼ hp. to 100 hp. at 100 r.p.m. The

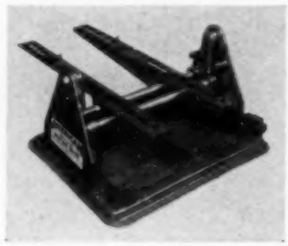


principle of operation is that a roller running between an outer ring and an inner flat surface will drive between the outer and inner members when rotation is in one direction, and release or run free when rotation is reversed or one member runs ahead of the other. The unit may be used either as a clutch or as coupling.

Motor Base

American Pulley Co., 4214 Wissahickon Ave., Philadelphia, Pa. (Vol.78,p.690.) 295.

In the American "tension-control" motor base the reaction torque has been utilized. The motor is suspended in a cradle and is free to rotate through a limited range. The pivot axis of the cradle is placed close to the motor axis

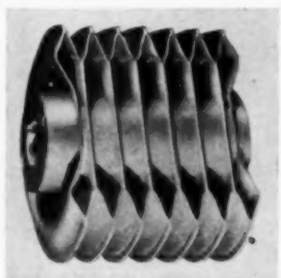


in order to obtain the maximum reaction effect. As the motor swings about the pivot axis, it increases the center distance enough to compensate for belt stretch and to vary the tension with each change in the load. The tension control motor base is offered for floor, wall or ceiling mounting.

Sheave, Texsteel, "Duro-Brace"

Allis-Chalmers Mfg. Co., Texrope Div., Milwaukee, Wis. (Vol.78,p.815.) 398.

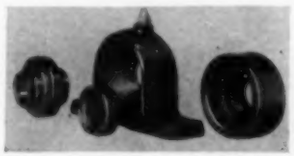
Duro-Brace sheaves are reinforced by a convex steel plate that strengthens the areas likely to bend under excessive overload The sheaves are welded at the rim and webs have interior grid-type construction for additional strength.



Pillow Block, Ball-Bearing

Fafnir Bearing Co., New Britain, Conn. (Vol.78,p.816.) 343.

This cork-insulated, ball-bearing pillow block has the features of silence and self-alignment. The bearing is of the wide-inner type with a self-locking collar. It has a deep-groove, large-ball design that affords high load capacity,



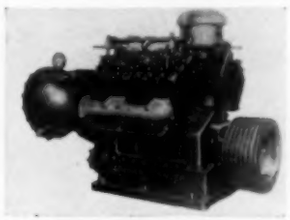
thrust as well as radial. The pillow block is prelubricated and lubrication is renewable by means of grease tubes. The insulation is a cork pad which fits around the bearing to insure silent operation.

Miscellaneous Equipment

Air Compressors, Vertical

Gardner-Denver Co., Quincy, Ill. (Vol.78,p.169.) 12.

This line of vertical air compressors is said to deliver the same amount of air as horizontals of the same capacity, but



offers lower price, installation cost and maintenance cost. Inlet and discharge valves are cushioned and silent. Large water jackets surround the cylinders and valves to assure minimum cylinder temperatures. A water-cooled intercooler increases volumetric efficiency. Pressure-feed lubrication is applied to all bearings.

Blower and Suction Cleaner, Electric, Portable

Skilsaw, Inc., 3310-20 Elston Ave., Chicago, Ill. (Vol.78,p. 425.) 151.

A portable electric blower and suction cleaner in five models is being manufactured for cleaning dust from motor windings and cleaning about

machinery. The device can also be used to operate a paint sprayer or blowtorch. The models can be equipped with electric heaters for blowing warm air.

Cooler, Steam-Operated

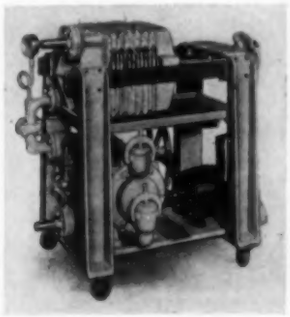
Elliott Co., Pittsburgh, Pa. (Vol.78,p.551.) 208.

A steam-operated cooler is being built in three different sizes up to 15 tons capacity. The equipment can be operated on waste steam, and uses no re-

frigerant other than water. The cooler is contained within a single tank 2 ft. in diameter and approximately 6 ft. in height. Within the tank is an evaporating compartment, a compressor, and a condenser.

Filter Press for Plating Solutions

T. Shriver & Co., Harrison, N. J. (Vol.78,p.30.) 4.

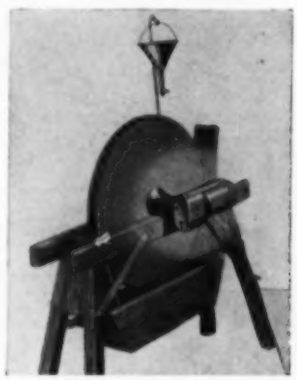


Removal of all suspended matter from plating baths to produce a smooth homogeneous plate and reduce buffing costs is the function of this filter press. The press is made up of a number of filter chambers. Each chamber is formed by a filter frame and adjacent filter plates, one on each side. Filter cloth covers the plates. The electrolyte is pumped into all these filter chambers simultaneously.

Grindstone, Power-Driven

Fleming Electric Tool Div. of Loring Coes & Co., Worcester, Mass. (Vol.78,p.169.) 29.

On one side the grindstone has a small electric motor connected through an over-riding clutch to the shaft of the stone, while the shaft extends beyond the framework on the other side and is keyed for a hand



crank. The motor drives the wheel at the rate of about 60 r.p.m. The machine is designed to take a 22x2 in. natural sandstone.

Gun, Grease, Industrial

Specialty Sales & Service Corp., 138 Holden St., Minneapolis, Minn. (Vol.78,p.394.)

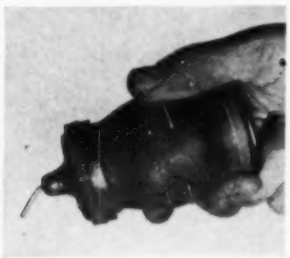
A portable industrial grease gun and tank for greasing jobs about the plant has been developed. The tank holding 10 lb. of grease is carried on the operator's back. The tank is filled three-quarters full of

grease and then charged with air at 100 to 125 lb. pressure. By working the handle the operator causes the pressure to be built up in the piston chamber to send the grease out in the gun head.

Gun, Graphite, "Graph-Air"

Joseph Dixon Crucible Co., Jersey City, N. J. (Vol.78,p. 459.) 177.

The "Graph-Air" gun illustrated is for blowing "Microfyne" flake graphite into mechanisms for lubrication. The volume is controlled by the position of the nozzle in relation to the dial on top of the gun.



Heaters, Unit

Fedders Mfg. Co., Buffalo, N. Y. (Vol.78,p.655.) 261.

A line of unit heaters, known as Series 3, has streamline tubes, patented fins and sturdy cabinets combined with resilient motor mountings to eliminate resonance and isolate vibration.

Header tanks have integral baffles to assure even steam distribution throughout the element. Full-floating mountings maintain the alignment of the heating element within the cabinet.

Helmet, Safety

American Optical Co., Southbridge, Mass. (Vol.78,p.588.)

The No. 660 safety helmet is made of tough fiber to withstand the blows of flying particles, yet is light in weight and does not tire the worker.

The head gear is adjustable and the helmet can be set easily and quickly in either an "on" or "off" position. Large, clear lights of laminated safety glass provide wide angle vision.

Heater, Unit

Modine Mfg. Co., Racine, Wis. (Vol.78,p.784.) 367.

Of the suspended, propeller-fan type, this heater is suspended directly from the steam line, and no brackets, pipe rods

or straps are required. Sixteen steam and fourteen hot water sizes are built.

Ladle, Electrically Heated

Struthers Dunn, Inc., 139 N. Juniper St., Philadelphia, Pa. (Vol.78,p.686.) 310.

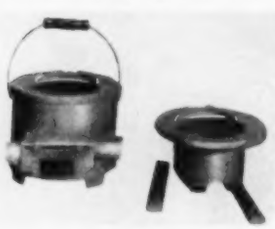
The "Dunco" electrically heated ladle, Style 612, has a capacity of 1¼ pints and is used for solder and babbitt. It has

a double lip for pouring. Electrical input is 330 watts. Temperatures up to 450 deg. F. are secured.

Pot, Solder, Electric

Harold E. Trent Co., 618-640 N. 54th St., Philadelphia, Pa. (Vol.78,p.853.) 392.

An improved model of the MP 45-lb. electrically-heated bath for tin, solder or hard-melting work has been brought out. The principal changes consist of an improved design of switch and plug box to facil-



itate connecting to a circuit. Electric strip units are pushed into two tubes cast into the bottom of the pot, obtaining better heat conductivity and longer life.

Recorders, Cost and Payroll, Electric

Simplex Time Recorder Co., Gardner, Mass. (Vol.78,p.393.)

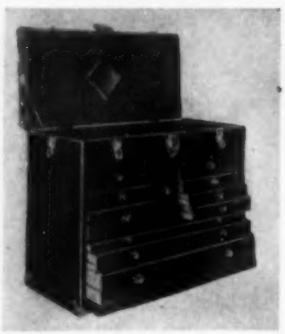
The cost recorder has an all-steel case and is arranged to fit any cost system. It will accommodate time cards, job tickets or slips of any length or

width. One of the features of this machine is the printing of the day or week or date of the month in a different color, which makes it easier to compute the elapsed time. The payroll recorder is fully automatic and is furnished in an all-steel case. The movement is driven by a Telechron electric clock.

Tool Chest

H. Gerstner & Sons, 131 Columia St., Dayton, Ohio. (Vol. 78,p.628.) 276.

This improved tool chest has a special compartment to hold an *American Machinists Hand Book*. In addition to three full-



length drawers, the chest also contains seven short-length drawers of assorted inside heights.

Truck With Utility Motor

Rockwood Mfg. Co., Indianapolis, Ind. (Vol.78,p.264.) 84.

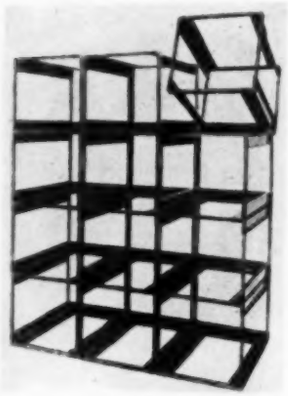
A portable truck carrying a motor is being offered for use in driving industrial machinery when the machine motor breaks

down or needs repairs. The truck consists of a standard Rockwood drive made as part of the truck. Alignment of the motor and driven pulleys can be quickly secured. Units of this sort will accommodate practically any make of electric motor or gas engine weighing up to 400 or 500 lb.

"Stackracks" for Stacking Boxes

Stackbin Corp., Providence, R. I. (Vol.78,p.785.) 373.

"Stackracks" are made to order for the stacking of cardboard, fiber, wood or steel boxes of any size. The bottom box is



always as accessible as the top one. The "Stackrack" is a single unit rack made of channel and angle steel and is finished in olive green enamel.

Vacuum Cleaner, Industrial-Type

Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio. (Vol. 78,p.887.) 407.

This industrial-type portable vacuum cleaner is for use in machine and tool shops. A four-stage turbine exhauster powered by a 1½-hp. motor produces a suction of 52 in. water gage, to pluck up dust, dirt, litter, metal chips and filings at the rate of 155 cu.ft. of air per min. Weight, 250 lb.

Vacuum Cleaner, Industrial

Breuer Electric Mfg. Co., 852 Blackhawk St., Chicago, Ill. (Vol.78,p.522.) 216.

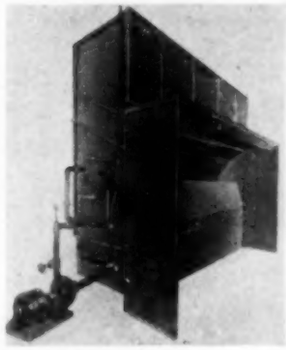
A Model 112 "Tornado" industrial vacuum cleaner is available with the following specifications: 1-hp. ball-bearing motor, weight, 45 lb., 12-gal.

zinc-steel tank, and complete set of standard attachments for all plant cleaning purposes. The motor unit can be removed for use as a blower.

Water Booths, Spray-Room

DeVilbiss Co., Toledo, Ohio. (Vol.78,p.361.) 106.

For prevention of the discharge of heavy, solid, sticky paint residues to the outside of buildings, a line of water booths has been developed. These booths may be operated in neighborhoods where the use of standard fan- or blower-type booths would be prohibited. The exhaust piping is easily located to suit particular conditions. "Opposed direction" sprays secure separation of solids.



Parts and Mechanisms

Bearings, Ball, Radial, Shielded

Bantam Ball Bearing Co., South Bend, Ind. (Vol.78,p. 363.) 110.

Offered for use in generators, small high-speed tools, grinders, motors, pumps and speed reducers, the No. 201 and No. 203 ball bearings are manufactured to S.A.E. standard limits. The bore of the No. 201 is 0.4724 in., and the outside diam-

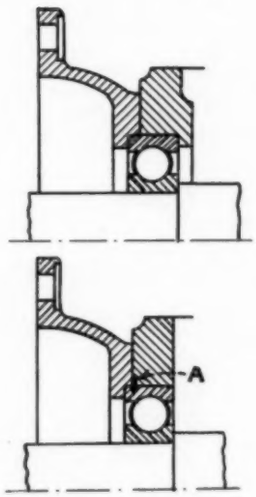
eter 1.2598 in., and the width 0.3937 in. Dimensions of the No. 203 are: bore, 0.6693 in.; outside diameter, 1.5748 in., and width, 0.4724 in. The shield retains the lubricant almost indefinitely.

Bearing, Ball, G-Type

Fafnir Bearing Co., New Britain, Conn. (Vol.78,p.587.) 205.

A type of ball bearing that eliminates one of the two shoulders formerly required in the housing, where it is necessary to provide for taking up a certain amount of thrust in both directions, has been placed in production. The modification consists of the addition of a wire ring snapped into place in a groove cut on the outside of the bearing outer ring. This wire protrudes $\frac{1}{4}$ in. to furnish a shoulder integral with the bearing itself. Abutting against the face of the housing, the ring does away with the need for a shoulder on the opposite side of the bearing.

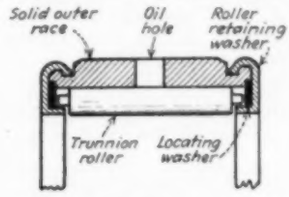
Designated by the letter G appearing after the number, this bearing is available or can be produced in eight sizes of the light 200 series, single row, and seven sizes of the medium 300 series.



Bearings, Roller, 7000 W Series

Roller Bearing Co. of America, Trenton, N. J. (Vol.78,p. 298.) 74.

The "20th Century" roller bearing is designed to eliminate the use of a retainer or cage, permitting the use of a full complement of rollers. Trunnion end-type rollers are used, retained in an inner area of the



outer race by two cyanided roller retainer washers, which are knurled over the ends of the outer race and maintained in a fixed position. The bearing is built in shaft sizes from 0.50 to 5.00 in. Outside diameters are 1.00 to 6.00 in.

Bushings, Bearing-Bronze

Magnolia Metal Co., 120 Bayway, Elizabeth, N. J. (Vol.78, p.454.) 175.

Bearing-bronze bushings are now available, semi-finished outside and inside, and in lengths of 12, 13 and 14 in. The bushings have no scale or sand to dull the tools. S.A.E. Specifications No. 64 and General Motors Specification 4050M. Brinell hardness, 55; tensile strength, 25,000 lb. per sq.in.

Bushings, Needle

Torrington Co., Torrington, Conn. (Vol.78,p.627.) 264.

A needle bushing has been developed that takes no more space than is required for bronze or babbitt bushings, and which incorporates the principle of a roller bearing. The outside shell is made of drawing steel, cyanide hardened to give a long-wearing bearing surface. Needle rollers are made from high-carbon steel hardened to

58 to 60 Rockwell C. The bushings are made in bore sizes of $\frac{3}{8}$ to $1\frac{3}{4}$ in.; outside diameters, $\frac{7}{16}$ to $2\frac{1}{8}$ in.; lengths, $\frac{1}{2}$ to $1\frac{1}{2}$ in.

Bushing, Needle, Closed-End

Torrington Co., Torrington, Conn. (Vol.78,p.890.) 414.

There are some locations where this closed-end needle bushing has advantages because

the one-piece outer shell raceway is closed on one end to facilitate the retention of oil and grease.

Capscrew, Socket-Head, Knurled

Standard Pressed Steel Co., Jenkintown, Pa. (Vol.78,p.555.)

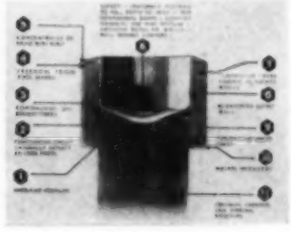
"Unbrako" socket-head capscrews are made with knurled heads. The object of knurling is to make the driving of screws quicker and cheaper. In intricate die assemblies there may be socket-head screws that

cannot be reached with a wrench. The mechanic may prefer to use his fingers to tighten the screws, and the knurling makes this possible.

Capscrew, Socket-Head, "Fibro Forged Screw"

Holo-Krome Screw Corp., Bristol, Conn. (Vol.78,p.887.)

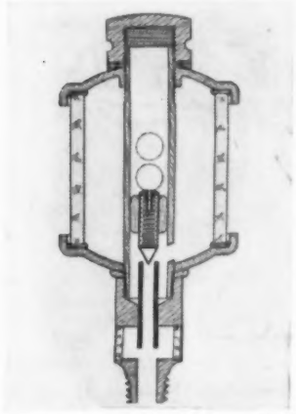
The method employed in the manufacture of this screw results in continuous uncut fibers from one end to the other, as shown by the illustration. A further feature is controlled grain size of the steel.



Lubricator

Victor Lubricator Co., 3907 N. Rockwell St., Chicago, Ill. (Vol.78,p.588.) 233.

The "1000-Series" automatic force-feed lubricator is of air-tight construction, self-contained and feeds oil under pressure generated within the lubricator.

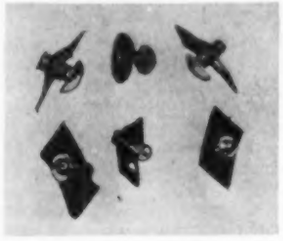


As the oil temperature varies it causes the expansion or contraction of a small quantity of air imprisoned bear the base of the filler tube. One or more drops of oil are forced through to the bearing below.

Nuts, Speed

Tinnerman Stove & Range Co., 2038 Fulton Road, Cleveland, Ohio. (Vol.78,p.427.) 71.

"Speed Nuts" are being marketed to replace an ordinary nut and lock washer. In use, the

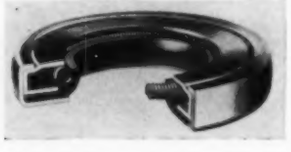


speed nuts are flipped over the threads of the machine screw or bolt, and with a turn or two of the screw driver they are locked securely in place under constant spring tension. On the Type B nut, the corners are turned down to form small locking prongs.

Seal, Oil and Grease

National Motor Bearing Co., 1197-78th Ave., Oakland, Calif. (Vol.78,p.782.) 350.

The Type BB seal consists of an outer case that locks the assembly and which has a press-fit of ± 0.002 in. on the diameter.



An equalizing annular garter spring within the case provides a uniform contact of the sealing member at all points circumferentually. The actual sealing member is made of various materials, to suit different conditions such as temperature, peripheral speeds, unbalanced pressures and chemical activity.

Valves, Thermostatic, Non-Electric

Fox Engineering Co., 36 Portland St., Boston, Mass. (Vol.78,p.552.) 218.

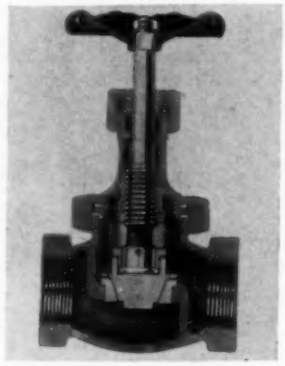
These non-electric thermostatic valves are self-contained units covering the range of tem-

peratures and pressures that are most commonly used. Illustrated is a liquid control of the immersion and surface type that is built in two temperature ranges —100 to 180 deg. F. and 200 to 400 deg. F. The differential is 5 to 10 deg. These controls have two metering valves to allow for both intermittent and continuous operation. Actuation of the valves is by means of a bellows.

Valves, "Renewo" and "Ferrenewo"

Lunkenheimer Co., Cincinnati, Ohio. (Vol.78,p.168.) 40.

For severe service demanding maximum resistance to destructive action on valve-seats, "Renewo" and "Ferrenewo" valves with plug-type alloy seats and disks have been developed. Full length, deep seated plugs



are ground each in its own seat. Iron - body, bronze - mounted "Ferrenewo" plug-type valves are made for 150 lb. steam pressure, while the bronze "Renewo" valves are available in 200 and 300 lb. steam patterns.

Wood Screw, "Speedized"

Elco Tool & Screw Corp., Rockford, Ill. (Vol.78,p.136.)

Chemically treated steel wood screws, said to require one-third the power needed to drive plain wood screws, are available in all standard sizes. The process by which these screws are finished is called "Speedizing."

Materials and Supplies

Alloys, Iron, "Cecolloy"

Chambersburg Engineering Co., Chambersburg, Pa. (Vol. 78,p.657.) 291.

"Cecolloy" is the trade name for a series of nickel-molybdenum, air-furnace iron alloys. Characteristics are homogeneous grain structure, tensile strength of 40,000 to 60,000 lb. per sq.in., and Brinell hardness which can be controlled to suit the purpose. Carbon content can be controlled within 0.05 per cent plus or minus. Castings up to 50 tons can be made.

"Alray" Process for Aluminum

Aluminum Co. of America, Pittsburgh, Pa. (Vol.78,p.137.)

An electrolytic brightening process has been discovered that increases the reflectivity of aluminum and at the same time leaves on the surface a protecting oxide film. A heavier protective oxide coating can be produced after the electrolytic brightening step by a second anodic process and without any substantial loss in reflectivity. Reflectivity of 87 per cent is had.

Belting, Leather, "Monobelt"

Alexander Bros., Inc., Philadelphia, Pa. (Vol.78,p.265.)

A general utility belting "Monobelt" is made from a vegetable-tanned leather having high adhesion and thoroughly stretched by a special process. In single-ply belts, leather with a minimum of stretch is used. In double-ply, belts the pulley side of the belt is made of the same leather as the single-ply, but the outer ply is made of more elastic leather. With such construction the internal friction is considerably reduced. This belt is made in only one standard thickness for each width, the thickness increasing with the width.

Bronze, "Olympic"

Chase Brass & Copper Co., Waterbury, Conn. (Vol.78,p. 395.) 149.

"Olympic" bronze is available in three types: Type A for hot-rolled and cold-rolled forms; Type B for free turning wire and rod; Type C for castings. Type A can be cold-rolled to 75 per cent reduction in thickness without becoming brittle, forges at a temperature of 1650 deg. F., flowing 70 to 90 per cent as much as brass at 1,450 F. Machinability said to be slightly better than hard copper, except Type B which it is claimed can be run in automatic screw machines at two-thirds the speed used for free-cutting brass rod. Type C is recommended for high strength sand castings, particularly for fine detail work. Tensile strengths; sand castings, 40,000 lb. per sq.in.; hard-drawn wire, 150,000 lb. per sq.in.

Bronze, Nickel-Aluminum

Chase Brass & Copper Co., Waterbury, Conn. (Vol.78,p. 428.) 159.

Greater corrosion - resistance and better physical properties are claimed for a nickel-aluminum bronze now manufactured. This material is a composition of approximately 92 per cent copper, 4 per cent nickel and 4 per cent aluminum. The hardness, when measured on the Rockwell F scale, varies between 70 and 110, depending on temper. Tensile strength ranges from 50,000 to 150,000 lb. per sq.in.

Carburizer, Liquid

E. F. Houghton & Co., 240 West Somerset St., Philadelphia, Pa. (Vol.78,p.628.) 259.

A depth of case from skin hardness to 0.04 in. can be secured with "Perliton" liquid carburizer. Advantages claimed include: Uniformity in depth of case and carbon content: low cost per ton of steel; longer pot life—up to 1,200 hrs.; no decarburization; non-hygroscopic; high thermal conductivity; no variation in degree of fluidity; reduced heating time, and no rust after water quenching.

Die Castings, Hydraulic

Pressure Castings, Inc., Cleveland, Ohio. (Vol.78,p.584.) 253.

By use of the hydraulic principle in die casting it is possible

to use pressures from 3,000 to 17,000 lb. per sq.in. for intricate castings. When the metal is injected into the mold under such high pressures, it is said that the resultant casting becomes intensely dense with an immense increase in tensile strength. Additional advantages claimed for the solid pressure method include the better handling of the molten metal throughout the process. The metal is kept plastic in a closed, non-oxidizing furnace.

Drafting Blocks

L. G. Wright Co., 9120 Fuller Ave., Cleveland, Ohio. (Vol. 78,p.455.) 161.

The "Wrigraph" draft block is made of ¼-in. Masonite board and equipped with paper clips to hold either a single sheet or pad of letter-size paper.

Either of two drawing attachments is provided. The first attachment is a combination 30, 60 and 45 deg. triangle. The other attachment consists of a protractor and straight edge.

Dressing, Rubber-Belt

B. F. Goodrich Co., Akron, Ohio. (Vol.78,p.653.)

A liquid belt dressing has been developed for rubber belts that merely softens the rubber surface but does not penetrate and deteriorate the body. The dressing increases pulley grip and horsepower delivery.

Goggle, Chipper's

Chicago Eye Shield Co., 2300 Warren Blvd., Chicago, Ill. (Vol.78,p.887.) 386.

The No. 535 chipper's goggle has individually molded right and left bakelite eye cups. These cups are shallower in design than formerly so that the lenses

set closer to the eyes and give a wider range of vision. All metal parts are finished in black to prevent glare. Baffled vents in the edge of the eye cups under the lens give cross circulation of air.

"Electriding" Process for Malleable and Gray Iron

Gunite Foundries Corp., Rockford, Ill. (Vol.78,p.30.) 11.

"Electriding" consists of converting the surface structure of malleable or gray iron into a hard carbide surface. Rockwell hardness of 42 to 45 on the C scale, and Brinell hardness of 350 to 375 are obtained. The feature of the process is the obtaining of this hardness to depths of 1/16 to ⅛ in. without changing or destroying the malleability of the structure beneath the hardened area.

Floor-Repair Material, "Amolastic"

American Oil & Disinfectant Corp., 129 E. 26th St., New York, N. Y. (Vol.78,p.233.)

A mastic compound added cold to sand, cement, gravel or traprock, for repair of broken floor surfaces in industrial plants has been developed. By adding more or less of these admixtures to Amolastic, a surface as soft as rubber for foot traffic or as hard as concrete for heavily loaded trucks can be produced.

Heat-Resisting Material, "Hi-Heat"

Kux-Lohner Machine Co., 2145-47 Lexington St., Chicago, Ill. (Vol.78,p.552.) 230.

"Hi-Heat" material is heat-resisting to 1800 deg. F., non-grain growing and anti-corrosive. The material is unaffected by aluminum or zinc, lead and tin-base alloys, and therefore is offered for use in metal pots, plungers, plunger sleeves, nozzles, thermocouple protecting tubes and ladles for die-casting machines. It can be machined to accurate dimensions and can be highly and permanently polished. The coefficient of expansion is high, but the material returns to its original size upon cooling. Tensile strength ranges from 45,000 to 50,000 lb. per sq.in. and the hardness from 250-270 Brinell.

Hose, Paint-Resisting

Electric Hose & Rubber Co., Wilmington, Del. (Vol.78,p. 489.) 190.

A Type DB paint fluid hose has been developed with inner tube *A* made of a special compound possessing the strength and flexibility of rubber, but being free of the usual tendency to soften, slough off, or disintegrate when in contact with oils or solvents. The hose is of braided and molded construction and the cover is made to resist wear. The sizes are ¼, 5/16, ⅜, 7/16 and ½ in. inside diameter. Any length up to 500 ft. can be furnished.

Lubricants, "Sta-Put" Improved

E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. (Vol.78,p.488.) 196.

An improvement has been made in the "Sta-Put" line of oils and greases that increases the film strength. When first developed the oil had increased ability to stay in place by treating it with selected mineral hydro-carbons. Now the addition of certain other hydrocarbons increases the load-carrying capacity.

Oils, Gear, Extreme-Pressure

E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. (Vol.78,p.780.) 366.

To the line of "Sta-Put" oils has been added a series of lubricants designed to meet extreme-pressure gear lubrication problems. This viscous oil series covers all the requirements from that of light-duty speed reducers to the heaviest of worm- or herringbone-type speed reducers operating under shock loads.

Paint, "Barreled Sunlight," Improved

U. S. Gutta Percha Paint Co., 19 Dudley St., Providence, R. I. (Vol. 78, p. 392.) 135.

"Barreled Sunlight" paint is offered with five improvements, as follows: Increased light reflecting properties, resistance to "yellowing," better spreading power, hiding power and ease of flow. The paint is put up in cans, 5-gal. buckets and large drums.

Phosphor-Bronze Bars

Aluminum Industries, Inc., Cincinnati, Ohio. (Vol.78,p.587.) 254.

Permite bronze bars are now available in standard 6 ft. lengths in diameters from ⅜ to 2 in., by 1/16 in. steps. The stock is claimed to possess exceptionally free machining qualities. Using tungsten carbide tools it has been successfully machined at speeds in excess of 1,500 surface ft. per min. without coolant. The turned finish which has been adopted for Permite bars is claimed to afford better gripping, thus avoiding excessive strain on the chucking mechanism.

Separator for Batteries, Exide-Ironclad

Electric Storage Battery Co., Philadelphia, Pa. (Vol.78,p. 556.) 243.

"Exide-Ironclad" batteries are now being equipped with separators made of "Mipor," vulcanized rubber which is permeated with microscopic passages permitting free diffusion of the electrolyte. Minute solid particles of active material are prevented from passing through.

Thread Lubricant, High-Temperature

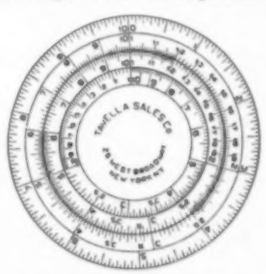
Armite Laboratories, 1900 E. 65th St., Los Angeles, Calif. (Vol.78,p.138.) 30.

A metallic-lead thread lubricant is being marketed for use in assembling machinery and in the repair of equipment subjected to heavy duty, high temperatures and abuse. The product is finely divided metallic lead in paste form, and by its use a film of metallic lead is formed between the threads to prevent galling.

Slide Rule, Circular

Tavella Sales Co., 25 West Broadway, New York, N. Y. (Vol.78,p.29.) 14.

A circular "Tasco" slide rule that fits the vest pocket has been placed on the market. The scales are etched in black on nickel silver disks 2¾ in. in diameter and weighing 3½ ounce. The length of the multiplication-



division scale is 6.3 in. as against 5 in. on the *A* scale of a regular 10-in., slide rule. The front side has five scales, Log, *C*, *D*, *CI* or *C* inverted and *K* scales. The reverse side has sine and tangent scales and an *A* and *D* scale for finding squares and square roots.

Steel, Screw, Bessemer

Union Drawn Steel Co., Massillon, Ohio. (Vol.78,p.654.)

A process has been developed for the manufacture of bessemer screw steel by which it has largely eliminated the abrasive elements which tend to wear away the cutting edges of tools. While no higher feeds and speeds are claimed, this development is said to have effected production economies through extension of tool life. The process is now being employed in the production of both "Free Cut" (S.A.E. 1112 Type) and "Supercut" (high sulphur) bessemer screw steels. This advancement has been accomplished without affecting the physical properties of the material.

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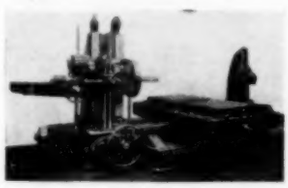
Boring Machines

Boring Machine, Horizontal

G. Richards & Co., Ltd., Broadheath, near Manchester, England. (Vol.77,p.771E.) F30.

This machine has a traversing spindle with all facilities for milling, drilling and tapping operations, but no automatic facing head. The bed is specially wide and greatly increased table accommodation is provided. Thus, the bed is 6 ft. 3 in. wide and the main or sliding table is 6 ft. 9 in. long by 5 ft. 6 in. wide. Its cross-traverse on the saddle is 7 ft. 3 in. On thlis main table can be mounted either a special revolving table 8 ft. long by 4 ft. 6 in. wide, or two 42 in. square independent revolving tables, as illustrated.

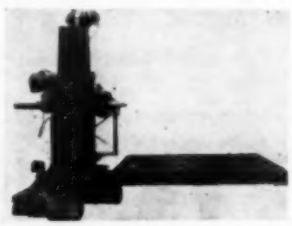


When large batches of identical pieces have to be machined, the work can proceed on one table while the other is being loaded.

Drilling Machines, Horizontal

W. Asquith, Ltd., Halifax, England. (Vol.77,p.784E.) F31.

All the traverse motions, in addition to the main drive, are obtained from separate motors, the motions being centrally controlled. A 10 ft. sq. workplate is bolted to the front of the traverse bed, but its outer support is not shown. Two auxiliary worktables, each having a working surface 6 ft. by 3 ft.

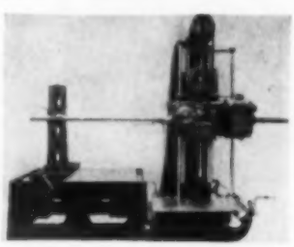


6 in. (not shown) are also supplied. The machine drills holes from ¾ to 2½ in. in diameter and bores up to 10 in. in diameter. The column has power and hand traverse on the bed of 8 ft. 6 in. Vertical power traverse of the spindle is 5 ft.; horizontal traverse 2 ft. 6 in. With six-speed gearbox and double gear, the minimum speed is 15 r.p.m.; the maximum, 1,000 r.p.m. Eight feeds range from 11 to 120 cuts per in. Maximum distance from the center of the spindle to the worktable is 7 ft. 6 in.; the minimum distance, 1 ft. 3 in.

Boring Machine, Horizontal

Kitchen & Wade, Ltd., Halifax, England. (Vol.78,p.118E.) F-80.

This horizontal drilling, boring and tapping machine will drill 3½-in. holes from the solid in cast iron. Holes up to 10 in. diameter can be trepanned in mild steel plates. Horizontal traverse of the column is 3 ft. 6 in., and vertical traverse of the saddle is 3 ft. Reverse and quick back-out motion for tapping is effected by means of one lever. The spindle is 2½ in. in

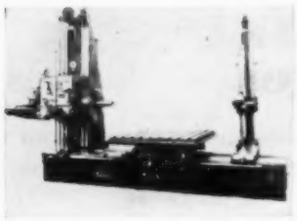


diameter and is bored No. 5 Morse taper, the length of feed being 18 in. The 18 spindle speeds range from 680 to 27 r.p.m., and eight power feeds from 36 to 150 cuts per in. Worktable dimensions 6 ft. by 5 ft. by 2 ft., 6 in. deep. Floor space, 11 ft. 3 in. by 11 ft. 3 in.

Boring and Milling Machine, Horizontal

Karl Wetzel, Gera, Germany. (Vol.78,p.131E.) F-84.

This machine has a high speed drilling spindle, a facing tool slide, and equipment for using dial gages and slip gages on the spindle head and table cross-slide. The drilling spindle is 4¾ in. in diameter, and the uninterrupted travel is 33½ in. Drilling spindle feed is 16¾ in. Maximum diameter bored is 23¾ in., and

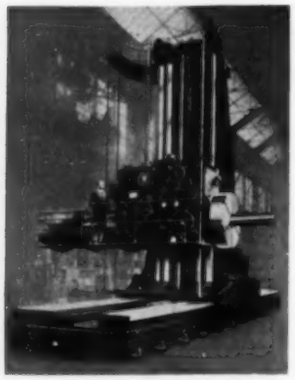


the maximum diameter for turning flanges is 47¼ in. Clamping surface of the rotary table is 47¼ in. by 55¼ in. Maximum distance from steady bearing to face-plate is 118 in. Table travel in direction of spindle, 72¾ in., across spindle, 53 in.; maximum height of spindle center above table, 1200 mm. Sixteen feeds of the drilling spindle range from 0.2 to 6.4 mm.

Boring Machine, Horizontal

Schiess-Defries (Great Britain) Ltd., 25 Victoria St., London, S.W., England. (Vol.78, p.133E.) F-88.

Built by Schiess - Defries A. G., Dusseldorf, Germany, this heavy boring and milling machine has a main spindle 8⅝ in. in diameter, and an auxiliary high-speed spindle 3⅜ in. in diameter. The spindle head is

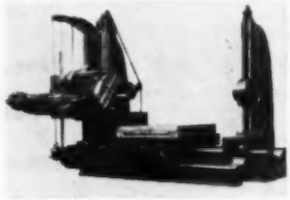


totally inclosed and is fitted to the column by double adjusting strips. Taken from the shaft in the outbearing arms are the spindle feeds in both directions and the quick power movements. In addition, the spindle has quick and slow hand movements operated through a worm reduction gear. Feed trains for the horizontal and vertical feeds are independent, but can be combined so that it is possible to use the horizontal hand feed while the vertical power feed is operating to mill irregular shapes.

Boring Machine, Horizontal, No. 6

H. W. Kearns & Co. Ltd., Broadheath, near Manchester, England. Vol.78,p.259E.) F128.

This machine weighs 46 tons and will do surfacing, boring, milling, drilling and tapping operations. The travelling spindle is 7½ in. in diameter, and will bore and drill 36 in. long at one setting or 72 in. at two settings. The maximum diameter faced by automatic chuck is 72 in. The machine will take boring bars up to 10 in. in diameter. Drive is by a 30-hp. motor. The main table measures 120 by 72 in., and the detachable turntable, 72 in. by 84 in. Longitundinal traverse of the table is 96 in., and the transverse movement 102 in. Twelve feeds, 2 to 384 cuts per



in. are provided to the facing slide. Power feeds in the same rates are also provided to the vertical movement of the spindle slide and the longitudinal and cross movements of the table. Maximum distance between the facing slide and the boring stay is 13 ft. The spindle has 24 feeds forward and reverse, ranging from 1.5 to 90 r.p.m. Floor space is 30x20 ft.

Boring and Surfacing Machine, Horizontal, No. 6

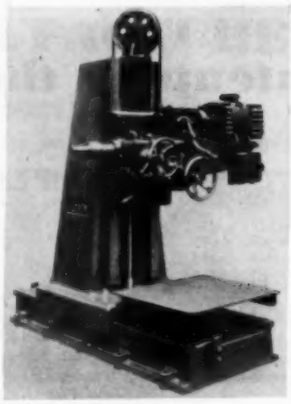
G. Richards & Co. Ltd., Broadheath, near Manchester, England. (Vol.78,p.273E.)

A Pearn-Richards No. 6 machine has been built without a traversing spindle, but with a bed 4 ft. longer and the upright 1 ft. higher than usual. Two boring stays are provided. The maximum distance between the boring bar socket on the facing head and the outer stay is 16 ft. The main table is 11 ft. long by 5 ft. wide and the top table is 6 ft. square. Standard threads from 2 to 16 in. can be cut. Special feed motion is incorporated to the saddle for threads of 1, 1½ and 2 in. pitch. The center spindle can be adjusted to 6 ft. 6 in. above the top or revolving table, while the cross traverse of the main table is 9 ft. 5 in.

Boring and Drilling Machine, Horizontal

F. Town & Sons, Halifax, England. (Vol.78,p.288E.)

This direct motor-driven horizontal drilling machine has a vertical traverse of the spindle of 3 ft. 6 in., and a horizontal traverse of 4 ft. The spindle is 1¾ in. in diameter and is bored No. 4 Morse taper. Horizontal traverse, 15 in. Four speeds range from 115 to 370 r.p.m. Three feeds are 60, 80,

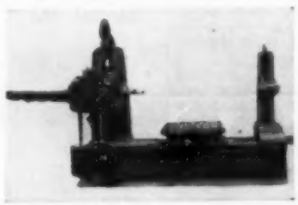


and 120 cuts per in. Floor space, 7 ft. 4 in. by 6 ft.; height, 9 ft.; weight, 4 tons.

Boring Machine, Horizontal

H. W. Kearns & Co. Ltd., Broadheath near Manchester. (Vol.78,p.320E.) F-146.

An electric drive has been applied to the No. 0 horizontal boring, drilling, milling and tapping machine, its main motor being used for this purpose, and a smaller motor for the rapid power motion of the table and spindle slide. Three sizes are 2½-, 2¾- and 3-in. spindles. For the 2¾-in. machine the spindle traverse and vertical movement

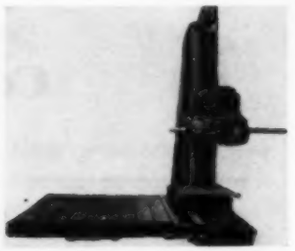


of the sliding head are 24 in. The maximum distance from the center of the spindle to the table top, 26 in., and from the spindle nose to the stay bearings, 5 ft. 6 in., while the table, 30 in. square, has a transverse movement of 24 in., and a longitudinal movement of 36 in. The 16 spindle speeds range from 10 to 400 r.p.m., but may be had in different ranges. The machine can still be provided for drive either by pulley and belt, or by single motor and gearing.

Boring Machine, Horizontal, 2½-In. Spindle

Kitchen & Wade, Ltd., Halifax, England. (Vol.78,p.470E.)

This machine can drill 3½ in. holes in cast iron and bore work up to 24 in. diameter. The saddle vertical traverse by hand is 6 ft. and the column horizontal traverse is 9 ft. The spindle has a horizontal feed of 30 in., and is supported through its full traverse by a steel

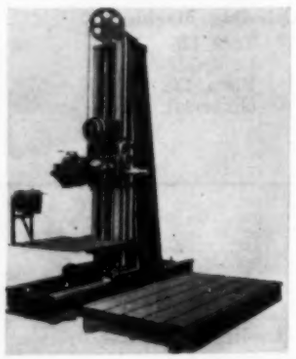


sleeve. The 36 speed changes range from 800 to 8½ r.p.m., and the eight power feeds from 36 to 150 cuts per in. The working surface of the baseplate is 10 ft. by 8 ft.

Boring and Drilling Machine, Horizontal

Kitchen & Wade, Ltd., Halifax, England. (Vol.78,p.566E.)

This machine is intended for drilling holes up to 2 in. diameter in mild steel, and for light boring and facing. The motor is built into the saddle and all controls are centralized. Traverse along the bed is 6 ft., and the drilling head has a vertical traverse on the column of 5 ft. The bed is 9 ft. 6 in. long by 2 ft. 10 in. wide. A traveling platform is provided



for the operator. Traverse of the spindle is 18 in. Six spindle speeds are available and three rates of feed.

Boring Machine, Horizontal, No. 5

G. Richards & Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p.633E.)

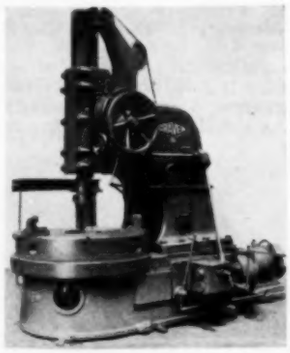
A No. 5 Pearn-Richards horizontal boring machine has a traversing spindle 5 in. in diameter and a facing capacity up to 54 in. diameter. The spindle and facing head can be revolved either independently or simultaneously. The traversing spindle has a range of 42

speeds, from 1.3 to 162 r.p.m. Facing head has 30 speeds from 1.3 to 116 r.p.m. Of the two tables, the top, or revolving table, has a squaring lock. The facing slide has eight automatic feeds, from 0.019 in. to 0.258 in. per cut and a similar number are provided to the traversing spindle horizontally. The spindle frame has vertical feeds from 0.009 in. to 0.129 in. Two boring stays afford support to long boring bars. Drive is by a 25-hp. motor.

Boring Mill, Wheel, 48-In.

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.77,p.699E.) F-11.

This boring mill for 48-in. carriage and wagon wheels has a table 54 in. in diameter, with a three-jaw concentric chuck. Drive to the able is by 15-hp.

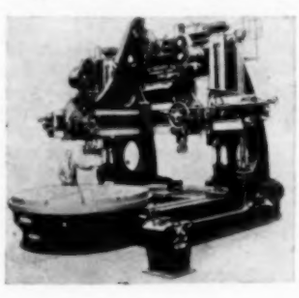


motor, the speeds being 20, 25 and 30 r.p.m. The spindle is 12 in. in diameter with 9-in. hole right through. Boring ram is 10½ in. in diameter and will take arbors with taper shanks. Automatic feeds are 1/32, 3/64 and 3/32 in. per rev. Weight, 11½ tons.

Boring Mill, Extension Type

G. Richards & Co. Ltd., Broadheath, near Manchester, England. (Vol.78,p.255E.)

This extension-type boring mill will admit work up to 10 ft. in diameter with the uprights in their forward or normal position, and up to 16 ft. in diameter with the uprights in their rearmost position. By the center boring reach shown in position, work up to the

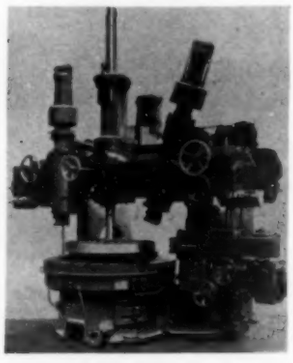


maximum diameter admitted can also be bored. The 9 ft. table is arranged to receive an outer ring to increase it to 14 ft. diameter. Two standard heads on the cross-slide each have a down feed of 48 in. The maximum height admitted under the toolholders is 72 in.; under the cross-slide, 82 in. Heads heave twelve feeds from 1/37 to ¾ in. per rev. The table speeds range from 0.886 to 12.311 r.p.m. The head on the overhanging reach has a total vertical traverse of 24 in.

Boring Mill, Wheel-Center

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.78,p.376E.)

This machine has been designed to bore, face and turn wheel centers with a minimum diameter of 2 ft. 6 in., up to maximum of 5 ft. 9 in. Having a boring head and two saddles on the cross-slide and also a side head with a four-position turret, the machine will simultaneously bore, boss and turn the periphery of a wheel center, and as the boring head and table rotate in opposite direction, equivalent boring and

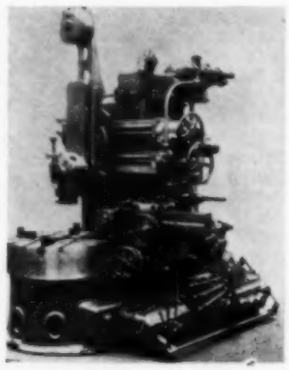


turning speeds are obtained. The left-hand head is normally used for facing the rims and the right-hand head for facing the bosses, while the side head turns the outside diameter. The table is 5 ft. 6 in. in diameter, and the distance between uprights is 5 ft. 9 in., and the height admitted under the toolholders is 17 in. The main drive is by 24 hp. motor. The six table speeds range from 3 to 15 r.p.m. and three boring speeds from 20 to 40 r.p.m. Six turning speeds range from 1/32 to ⅛ in. per rev., six boring feeds from 1/64 to 1/12 in. per rev. Travel of the rams, vertical and side, is 18 in., and of the boring bar, 24 in.

Boring and Turning Mills, Side-Head, 36-In.

Webster & Bennett, Ltd., Coventry, England. (Vol.78,p. 634E.) F-245.

This 36 in. boring and turning mill with turret and side

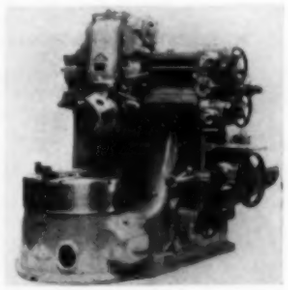


head has a centralized control. The main turret has five faces, and a geared revolving arrangement is fitted. The swivel slide is graduated in degrees for taper boring and turning. The side-head turret is controlled and locked in four positions by a cam lever. The chuck has four independent reversible jaws. Independent feed boxes giving similar ranges of feed are provided for the head. The main head admits work 38 in. diameter, 35 in. high under the turret, and 27 in. high under the cross-slide. Vertical feed of the turret is 26 in.; horizontal feed, 21 in. The side head admits work of 38 in. diameter and a maximum height with turret over the table of 16 in. Total movement, vertical and horizontal, of the ram is 20 in.

Boring and Turning Mill, 36-In.

Webster & Bennett, Ltd., Coventry, England. (Vol.78,p. 661E.) F-274.

In this 36 in. "Maxipower" boring and turning mill, holes 13½ in. long can be bored up to 21½ in. in diameter and 20 in. long from 21½ to 36 in. in diameter. The machine admits 40 in. in diameter by 20 in. in height under the cross-slide, and 28 in. under the turret. Vertical feed of the turret is

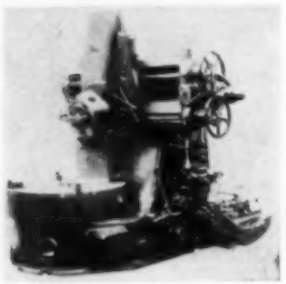


22 in., while the horizontal feed of the chuck center outwards is 25 in. The 12 speeds in the standard range are from 5.5 to 120 r.p.m., and the 12 feeds from 4 to 192 cuts per in. For average work the motor is of 25 hp. The turret has five machined faces. The swivel slide is graduated for taper work.

Boring Mill, 48-In.

Webster & Bennett, Ltd., Coventry, England. (Vol.78,p. 679E.) F-286.

This machine will use tungsten carbide or high speed tools. The turret with five faces has a geared revolving mechanism for indexing the turret stations. The swivel slide is graduated for taper turning

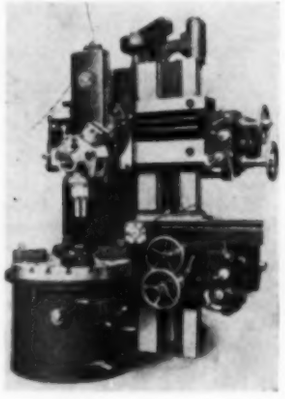


and boring. All feeds are positive, reversible and interlocked. Rapid power traverse of the slide is available in all directions, and the machine may be furnished with a taper-generating attachment, combining the vertical and horizontal movements of the tool. This is available for tapers from 0 to 45 deg. with the horizontal or vertical. A pulley-crowning attachment is available for pulleys up to 48 in. diameter by 12 in. width of face. The machine will admit work up to 52 in. diameter by 35 in. in height under the turret, and 24 in. in height under the cross-slide. Holes 16 in. deep can be bored. Vertical feed of the turret is 26 in.; horizontal feed, 32 in.

Lathe, Vertical Turret

Schiess-Defries (Great Britain), Ltd., 25 Victoria St., London, S.W., England. (Vol. 78,p.83E.) F-61.

This machine has speeds and feeds suitable for tungsten-carbide tools and is equipped for dual control by hand and pedal. The turret slide can be swiveled 45 deg. in each direction. Tools are secured by eccentric half-sleeves which do not project from the turret face so that the

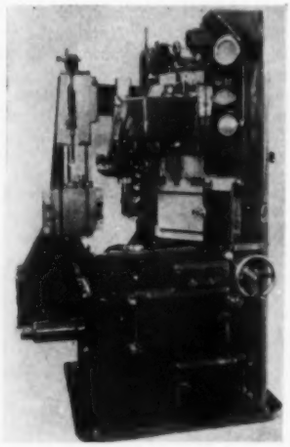


tool holders can be easily attached. The side-head mechanism operates independently and it has a square tool box. Specifications: Maximum turning diameter, 49 in. normally and 55 in. with the side head in its lowest position; diameter of table, 47 in.; greatest distance between table and turret, 52 in.; total cutting effort, 10,000 lb. at 39 in. diameter; number of table speeds, 12; number of feeds, 8, and power required, 40 hp.

Lathe, Vertical

Thomas Ryder & Son., Ltd., Bolton, England. (Vol.78,p. 592E.) F-209.

The No. 12 Rydermatic lathe is a vertical, single-spindle, three-slide, multi-tool automatic with pushbutton control. Maximum swing is 15 in.; length between centers 15 in., although this can be increased; and the clearance length above the chuck face is up to 3 ft. The turning slide stroke vertical is 8 in.; the facing slide stroke, horizontal, 5½ in., and the auxiliary slide stroke 4 in. at any angle. The speed range is from

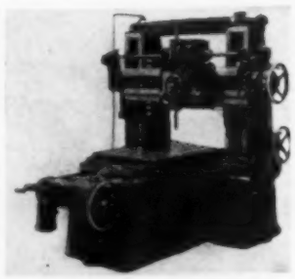


30 to 610 r.p.m., and the feed range from 23 to 400 cuts per in. The machine can be supplied in various types, including two-slide and three-slide, the latter with the third slide either pusher operated or cam drum operated. The turning slide has full rectangular motion which can be converted either to straight or former-operated motion if required. The main turning and facing slides are fed by hardened steel cams, with variations by change wheels.

Boring Machine, Jig

S. G. Jones, Ltd., 8 Balham Hill, London, S.W., England. (Vol.78,p.304E.) F-142.

This jig boring machine has been developed by Henri Hauser, S.A., Bienne, Switzerland, in collaboration with Hille-Werke. Dresden, Germany. It is a No. 5 size and has a



drilling capacity up to 1¼ in. from the solid. Total vertical feed of the drill is 7 in., and the maximum free space between the table and nose of the spindle is 27½ in. The head which carries the spindle has a movement of 27½ in. on the horizontal cross-rail, while the machine table has a movement of 35½ in. Its working surface is 29½ by 43¾ in. Distance between uprights is 39¾ in. The cross-rail can be supported in any of a number of definite positions by means of hardened and ground rectangular blocks to insure accurate parallelism between the cross-rail and the table surface. Graduated drums and verniers permit readings to 0.0005 in., and 0.00005 in. respectively. Spindle speeds in 13 steps are 50 to 750 r.p.m.

Boring Machine, Precision, Double-Ended

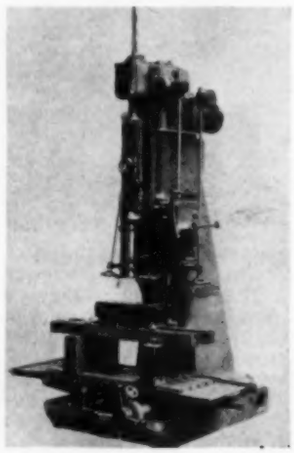
Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.618E.) F-236.

For a description of the No. 46A Heald double-ended "Bore-Matic" refer to page 70 of the American section.

Boring Machine, Precision, Vertical

Mayer & Schmidt, Offenbach-on-Main, Germany. (Vol.78,p. 85E.) F-65.

Intended for precision boring of cylinders from 2 7/16 to 5 7/16 in. in diameter, the machine utilizes an "Albo" single tool spindle. This spindle consists of a housing containing the spindle which

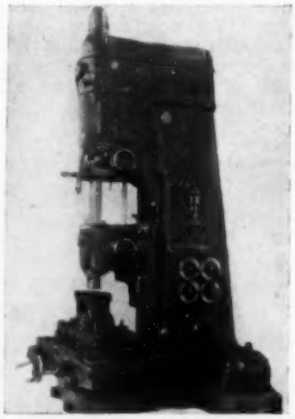


is pivotally coupled to the driving spindle so that vibration set up by the drive is not transmitted. Rotary speed of the spindle is adjustable between 166 and 750 r.p.m. The feeds are 0.025 to 0.04 mm. per rev. in four steps. Downward feed is effected automatically. The table has a longitudinal travel by means of a rack and worm gear. Transverse movement is controlled by a fine pitch screw.

Boring Machine, Precision, Vertical

Hille-Werke, A.G., Dresden-Reick, Germany. (Vol.78,p. 132E.) F-86.

This precision boring machine for cylinders uses carbide tools. Boring capacity is 8¾ in.; distance from center of boring spindle to column, 15¾ in., and total travel of spindle 19¾ in. Nine spindle speeds range from 190 to 3,000 r.p.m., and nine feeds from 0.01 to 0.25 mm.

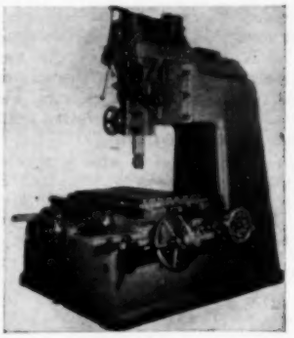


per rev. The boring spindle is driven by a standard horizontal motor, and (1) can be advanced rapidly to the working piece; (2) has a selective feed to a predetermined boring depth; (3) is provided with spindle disengagement and brake, and (4) can be rapidly withdrawn to the original position.

Boring Machine, Precision, Vertical

Stedall-Dowding Machine Tool Co., St. John St., Clerkenwell, E.C., England. (Vol.78, p.483E.) F-183.

This machine is built by H. Lindner, G.m.b.H., Berlin, Germany, and represents a combination of a jig boring machine with a precision boring machine for the production of holes of exact diameter and with high surface finish. The measuring tables are in the form of a cross-slide. In the center of the lower table is the hardened and ground measuring screw which has limits of 0.005 mm. in a length of 1,000 mm. The fine boring spindle runs in a head which is fixed on the pillar.

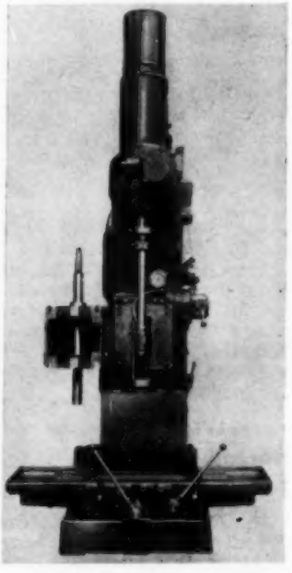


Spindle speeds are 50 to 1,900 r.p.m. Feed range is variable between 0.001 to 0.0071 in. per rev.

Boring and Honing Machine

W. Asquith, Ltd., Halifax, England. (Vol.78,p.148E.) F91.

Adapted for boring and honing automobile cylinder blocks, this machine has a working surface 4 ft. long by 18 in. wide. Longitudinal traverse of the table is 3 ft., and the transverse traverse, 6 in. Vertical feed of the spindle is 15 in. Boring and

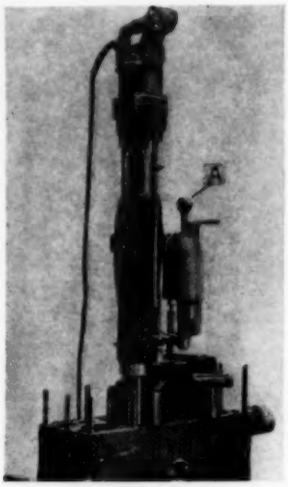


honing feeds are obtained from an independently driven hydraulic mechanism. The spindle has six speeds, doubled by means of a two-speed gear box, thus giving different ranges for boring and honing. The maximum depth of work admitted is 24 in.

Reboring Machine, Cylinder

Mansions Motor Co., Ltd., Vandon St., Westminster, S.W., England. (Vol.78,p.177E.) F96.

This self-contained electrically driven boring bar with hydraulic feed is for reboring worn automobile cylinders. A single-point tungsten-carbide cutter is traversed down the cylinder under oil control. The



cutting speed is about 350 to 450 ft. per min. The tool will deal with diameters up to 4⅛ in. 12 in. long., and bores can be machined within plus and minus 0.0025 in. for roundness, and within 0.0005 in. for parallelism.

lowering motion, besides the cross movement of 33 in. The 24-in. square revolving table is mounted on the first table and provided with a squaring mechanism.

Boring Machine, Cock

Adcock & Shipley, Leicester, England. (Vol.77,p.698E.) F-10.

This machine is for the taper plug holes of cocks. The table carries a self-centering fixture, which by means of a series of loose jaws, can be made to suit cocks of all sizes. The spindle is vertical and the speed is 4,000 r.p.m. The tool used is a combination drill and reamer. The table carrying the work is fed down by the capstan wheel and rack and pinion.

Boring Machine, Valve-Body, Triple-Head

G. Richards & Company, Ltd., Broadheath, near Manchester, England. (Vol.78,p.456E.) F-176.

This triple-head facing and boring machine machines valve bodies with three flanges. Heads are independent, so that the machine can be employed with one, two or three heads as desired. It will face and edge 24 in. in diameter. Maximum and minimum center heights measured to the top of the table are 14 and 4 in., respectively. Each head has a traverse of 20 in. along the bed, and the maximum distance between the opposing heads is 4 ft. 3 in. The main table, 42x24 in., has raising and

Broaching Machines

Broaching Machine, Horizontal, Hydraulic

Elbe-Werke A.G., Dresden, Germany. (Vol.78,p.84E.) F-62.

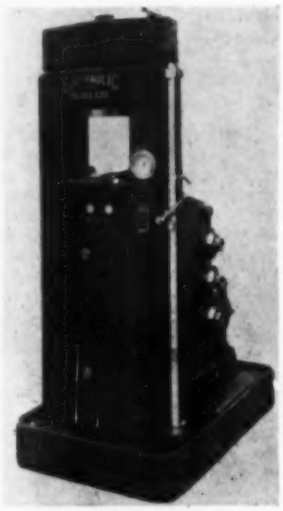
This hydraulic broaching machine employs the "Enor" oil gear. The maximum stroke is 40 in., adjustable by stops, and the cutting speed ranges from 0 to 120 in. per min., the return being 360 in. per min. Maximum working pressure is 212 lb.

per sq.in. The drive to the oil gear is by a 5-hp. motor. Weight, 3,300 lb. A station for the switches controlling the drive is arranged on the frame of the machine, the drive from the motor being by double V-belts.

Broaching Machine, Vertical

Drummond Bros., Ltd., Guildford, England. (Vol.78,p.658E.) F-268.

This hydraulic broaching machine of 15-ton capacity has the pulling-head guides, broach-lifter guides and pump housed in one casting. Apart from threading the work over the broach, the cycle of movements is automatic. The motor is coupled direct to the pump. The broach moves upward on the cutting stroke. Stepless variation of feed to the broach is carried out in two stages, from 0 to 15 ft. per min., and from 15 to 40 ft. per min. Maximum length of broach taken is 50 in.; maximum length of broach with work, 55 to 60 in.; greatest diameter broach, 3½ in.; maximum pulling stroke, 48 in.; width of frame opening, 15 in.; height, 14¾ in. The motor is controlled by a push button for starting and stopping, so that the stroke may be stopped at any point. In addition, the pulling head motion may be reversed by reversing the control lever. The load on the broach is regulated by an adjustable relief valve.

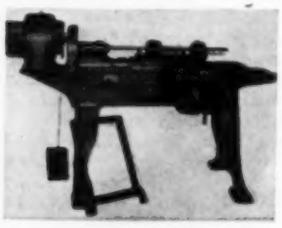


Drilling Machines

Drilling Machine, Horizontal

F. Pollard & Co., Ltd., Leicester, England. (Vol.77,p.737E.) F-20E.

This small special two-spindle machine is designed for drilling blind holes in gas-stove doors and frames. The spindles are adjustable to suit any variation



in the difference between the two lugs that have to be drilled. Feed is automatic in three ratios. The worktable has vertical adjustment.

Drilling Machine, Horizontal, Precision

Jones & Shipmman, Ltd., Leicester, England. (Vol.77, p.178E.) F-98.

This bench machine is suitable for drilling fine holes ranging from ☆ to 0.005 in. diameter. The spindle speeds are infinitely

variable between limits of 5,000 and 15,000 r.p.m. On the model driven by electric motor, a friction drive is employed which can be adjusted readily for the desired speed. On the air-driven machine the variation in speed is controlled by lever which regulates the air pressure. The table is mounted on steel balls.

Drilling Machine, Horizontal, Five-Spindle

F. Pollard & Co., Ltd., Leicester, England. (Vol.78,p.655E.) F-262.

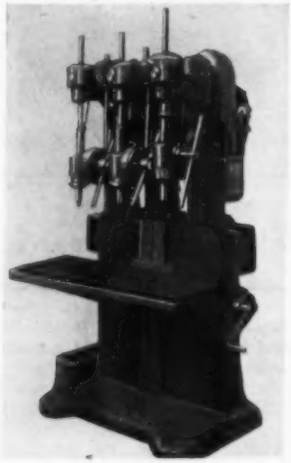
Each fixture is loaded in turn and by the time the last spindle is in operation work on the first piece has been completed. The capacity is up to ½-in. holes, and the length of stroke is 1½ in. Feed stroke, 1 in. The feed to

each spindle is direct by its own cam. All cams are carried on one shaft, the feed per revolution ranging from 0.0014 to 0.003 in. The main spindles can be fitted with multi-heads so that two or more holes can be drilled in a given workpiece. Center distance between spindles, 6 in.; height from table to spindle center, 2½ in.

Drilling Machine, Vertical, Three-Head

Adcock & Shipley Leicester, England. (Vol.77,p.727E.) F-18.

Drilling machines of this type are being built with from one to six spindles. Standard motors are used for the drive, one to each head, the motor being placed at the back and driving through spur gears. The spindles have automatic feed mechanism but hand feed can be provided. Spindles may be bored No. 3 Morse taper,

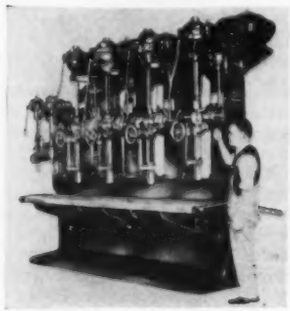


or equipped with or without flanged quills. A superspeed head may be fitted to run at 12,000 r.p.m. Each sliding head has an adjustment of 9 in. Maximum distance from spindle nose to table is 2 ft. 6 in. Distance from the center of the spindle to the face of the column is 10 in. Usually the heads are mounted on 12 in. centers.

Drilling, Boring and Facing Machine, Vertical

Jones & Shipman, Ltd., Leicester, England. (Vol.77, p.727E.) F-19.

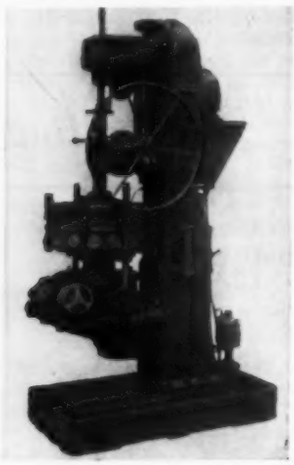
Drilling, boring and facing operations on the end shields of electric motors can be done. The machine mounts two of the firm's 20 in. manufacturing drill heads for producing the internal pilot hole, plus two of the firm's No. 1 heads and two extra heavy heads, No. 5, for the facing and boring operations. The spindles are fed by cams, each spindle bracket is mounted on slide ways to accommodate various heights of jigs and fixtures. Each spindle can be raised 8 in. in addition to the cam feed to clear the fixture.



Drilling Machine, Vertical, 28-In.

F. Pollard & Co., Ltd., Leicester, England. (Vol.77, p.736E.) F-20A.

This Corona standard upright heavy-duty, all-geared, 28-in. machine has a main spindle carrying a 20-spindle head for drilling holes in wheel centers or hubs. The number of holes required is 40, these holes being arranged 20 each on two different circles, one at



a higher level than the other and staggered. Feed is obtained from the drilling machine quill. As this moves downward the drills enter the work at the correct angle. To drill the second row the internal part of the fixture is moved the required distance around the circle and at the same time by means of a cam the part is raised as required.

Drilling Machine, Vertical, 24-In.

Adcock & Shipley, Leicester, England. (Vol.78,p.26E.) F-41.

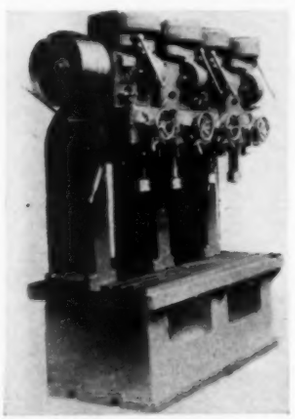
This sliding-head vertical drilling and tapping machine

will drill up to 1¾ in. in cast iron and tap up to 1¼ in. Withworth. Distance from the center of the spindle to the column is 12⅛ in., or to the face of the sliding head 10¾ in. The spindle has a vertical traverse of 12 in. Eight spindle speeds range from 38 to 444 r.p.m. Three feeds range from 70 to 280 cuts per in. For the tapping motion positive reversing clutches are used, and the reverse is actuated by a lever in front of the machine, or by a pedal. The sliding head has a vertical adjustment of 16 in. Either a circular or a compound table may be fitted.

Drilling Machine, Vertical, Four-Spindle

Adcock & Shipley, Leicester, England. (Vo.78,p.208E.) F-108.

This machine is used for machining Diesel engine connecting rods. Four saddles are arranged in pairs, the saddles being independent as to speed and feed. The spindle traverse is 16 in., and the minimum centers between the outer pairs



are 11½ in., and the maximum centers are 15 in., minimum centers being 19½ in. between the inner pair. The spindles are bored No. 5 Morse taper. Fast and sensitive feed is obtained by a capstan wheel down to the work, when the automatic feed is engaged by a lever. Speed range 56 to 188 r.p.m. in 10 steps, and feeds 40 to 125 rev. per in. in 9 steps. Working surface of table 70 in. by 16 in. Power required, 20 hp.

Drilling Machine, Vertical, Hydraulic

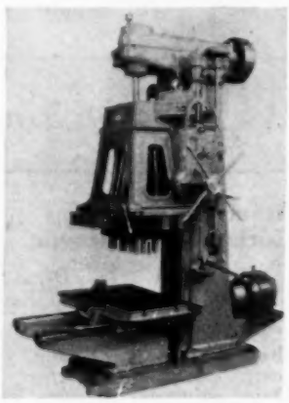
Christen & Co., Berne, Switzerland. (Vol.78,p.557E.) F-201.

This drilling machine with hydraulic feed has a maximum travel of 4⅞ in. and drilling capacity of ¾ in. in steel. When belt-driven the three speeds range from 500 to 1,500 r.p.m.; when motor-driven the six speeds range from 500 to 2,000 r.p.m., or from 500 to 4,000 r.p.m., using a two-speed motor. The feeds range without steps up to 0.04 in. per rev. The hydraulic feed mechanism and the main spindle bearing are mounted on a separate sliding head, adjustable by a distance of 5½ in., while the table can be raised or lowered a distance of 14½ in. The speed is automatically diminished during penetration of the material to prevent drill breakage.

Drilling Machine, Vertical, Multiple-Spindle

E. H. Jones, Ltd., Islington, London, N., England. (Vol.78, p.658E.) F-267.

The Hille multiple-spindle drilling machine is semi-automatic in operation. For tapping, disengaging chucks are usually employed, with automatic feed regulated to the pitch of the thread. As a tapping machine only the machine may have one or four speeds,



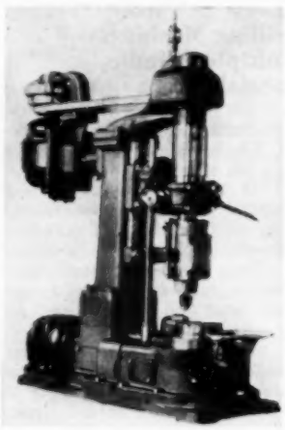
and as a drilling and tapping machine it has a special slow-speed gearing for two or eight speeds. The capacity of the machine for drilling in steel with eight spindles is ¾ in. diameter, or with 18 spindles, ½ in. From the center of the head to the column face is 12¾ in., and the travel of the head on the column is 15¾ in. The

maximum distance between the baseplate and the underside of the head is 4 ft. 1 in.

Drilling Machine, Automatic, Bench-Type

Jones & Shipman, Ltd., Leicester, England. (Vol.78,p.161E.)

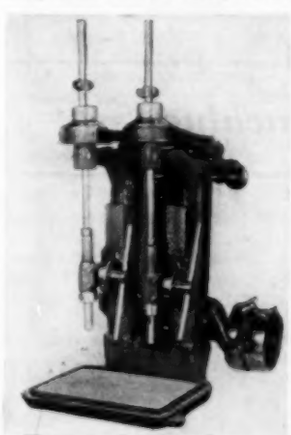
A 12½ in. high-speed automatic bench drill has been developed for drilling and tapping. The drill has an automatic feeding device to the spindle synchronized with a 12-station indexing table. The feed is by cam which brings the spindle down to a predetermined depth and then returns it to the top position. Here it



is held long enough to permit the table to index, when the spindle is again brought down and the cycle repeated. For the automatic feed and indexing mechanism, a separate motor is provided on the base. Three spindle speeds are 5,700, 7,800 and 10,000 r.p.m. Sliding head has a vertical adjustment of 3½ in. and the maximum distance from the spindle nose to the table is 6¼ in. and the depth of feed of the drill is ¾ in. The capacity of the chuck is up to ¼ in.

Drilling Machine, Sensitive, Two-Spindle

Adcock & Shipley, Leicester, England. (Vol.78,p.194E.)



Drive for the spindles is taken from a common countershaft. The machine drills holes up to 1 in. diameter. Vertical movement to each spindle is 4⅝ in., and the distance between the spindle centers is 8½ in. The sliding heads have vertical adjustments of 12 in. Spindle speeds range from 450 to 1,066 r.p.m. with ball bearings.

Drilling Machine, Sensitive, Bench

Jones & Shipman, Ltd., Leicester, England. (Vol.78, p.242E.) F-117.

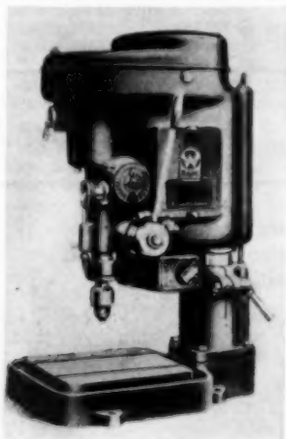
The spindle carries a ⅝-in. chuck and speeds up to 10,000 r.p.m. may be had. Drive is by a motor mounted at the back and then by a round belt totally inclosed. Each pulley has two steps. With the standard motor the speeds range from 700

to 3,000 r.p.m., or from 1,400 to 6,000 r.p.m., or up to 10,000 r.p.m. as special. Distance from the chuck nose to the table is 3 in. maximum and ½ in. minimum. Sensitive feed is 1 in. The table is 5 in. in diameter and is adjusted vertically 1½ in.

Drilling Machine, Sensitive

Webo G.m.b.H., Erkrath, Dusseldorf, Germany. (Vol.78, p.254E.) F-121.

This machine can be used as a bench or column type. All rotary members are dynamically balanced. The drill is made in two sizes, ¼ and ½ in. maximum capacity, the smaller having a

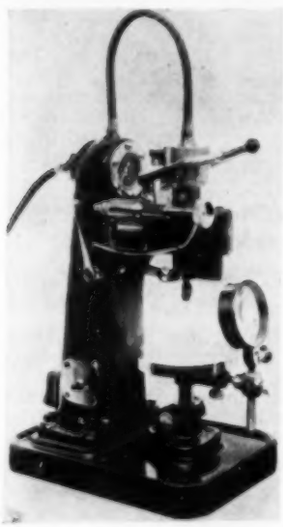


drilling depth of 2¼ in., and the larger, 4 in. Maximum distance between the chuck and the table is usually 6¾ in. in the smaller machine and 10 in. in the larger machine. The smaller unit has a table 10x10 in. square, the range of spindle speeds being from 1,100 r.p.m to 12,000 r.p.m. The larger machine has a table 12x12 in., and spindle speeds ranging from 750 to 6,000 r.p.m.

Drilling Machine, Sensitive, Bench-Type

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.661E.)

The spindle is driven by air pressure at speeds from 60,000 to 80,000 r.p.m. Maximum air pressure required is 80 lb. per sq.in. Stroke of the spindle is 1⅜ in., and the drilling capacity is from 0.010 in. to 1/32 in. diameter. Because of the fineness of the drills used, a special feed arrangement is employed. Operation of the feed lever brings the end of a second lever on the side of the machine into



contact with a stop which is set to locate the drill just above the work. As the pressure is maintained on the hand lever, the stop is withdrawn by means of a fine threaded screw with knurled head, thus allowing the drill to feed downwards the amount allowed by the screw adjustment. On release of the pressure from the control lever, the drill spindle returns to its normal position by means of a spring-loaded lever. An adjustable magnifying glass is attached to the table.

Drilling Machine, Radial, 3 Ft. 6 In.

G. Swift & Sons, Ltd., Halifax, England. (Vol.77,p.755E.)

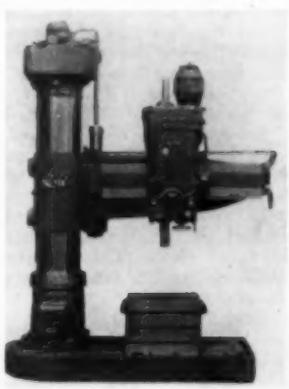
Power elevating motion for the arm is now obtained from the main driving motor. Work up to 4 ft. 3 in. deep can be admitted between the spindle and the baseplate, which has a work-

ing surface 3 ft. 5 in. long by 3 ft. wide. The arm can be swung to a complete circle and the saddle is mounted on roller bearings. Drive is by a 5-hp. vertical motor, and all shafts revolve on ball bearings. Eight spindle speeds range from 30 to 500 r.p.m., in the forward direction, or alternately four forward and four reverse spindle speeds are obtained through multiple-disk friction clutches. Three automatic feeds are 60, 90 and 120 cuts per in. Weight, 2¼ tons.

Drilling Machine, Radial, Hydraulic

G. H. Alexander Machinery, Ltd., Coleshill St., Birmingham, England. (Vol.78,p.265E.)

Raboma Maschinenfabrik, Berlin-Borsigwalde, are the builders of this fully-hydraulic radial drill with an arm 4 ft. 11 in. long, and horizontal traverse of spindle, 3 ft. 10 in. Minimum radius of the spindle is 2 ft. Maximum and minimum distances from the spindle to the baseplate are 5 ft. 9 in., and 1 ft. 3 in. respectively. The

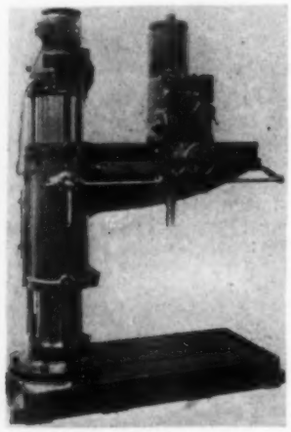


fifteen drilling feeds are available from 0.006 in. to 0.075 in. per rev. The speeds range in 20 or 36 changes from 19 to 1,320 r.p.m. Spindle drive is by means of two adjustable Jahns-Thoma rotary pumps which are actuated by servo motors. A range of speeds from 10 to 1,000 r.p.m. is obtained. For threading the spindle is hydraulically reversed from right to left-hand or brought to a standstill.

Drilling Machine, Radial 4-Ft.

F. Town & Sons, Halifax, England. (Vol.78,p.604E.)

Holes up to 2 in. can be drilled in steel. Drive of spindle is by a 5-hp. reversing, vertical motor mounted direct on the saddle. Slide and arm are locked simultaneously by a lever at the bottom left-hand side of the slide. Maximum radius of

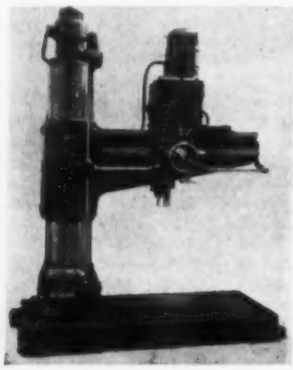


the spindle is 4 ft. 1 in., and the horizontal traverse of the spindle is 2 ft. 10 in. Maximum distance from the spindle to the base is 4 ft. 6 in. Working surface of baseplate 4 ft. 1 in. by 2 ft. 10 in. wide. Nine speeds range from 40 to 800 r.p.m.

Drilling Machine, Radial, 5-Ft.

Kitchen & Wade, Ltd., Halifax, England. (Vol.78,p.610E.)

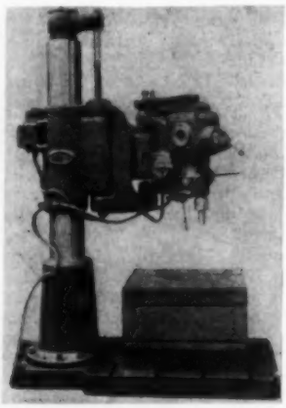
The 5 ft. machine is representative of a line which includes 4 and 6 ft. models. A reversing motor at the top of the column is used for raising and lowering the arm, and the drill spindle motor is mounted on the saddle. Column diameter is 15 in. Vertical adjustment of arm, 2 ft. 6 in. Controls are centralized on the saddle. The 18 speeds range from 30 to 1,000 r.p.m., and the six feeds from 36 to 150 cuts per in. Total feed movement of spindle is 15 in. Maximum and minimum distance from the spindle end to the box bed are 4 ft. and zero.



Drilling Machine, Radial, Articulated-Arm

W. Asquith, Ltd., Halifax, England. (Vol.78,p.657E.)

In this articulated arm, radial drilling and tapping machine, the maximum radius is 3 ft. 6 in. and the minimum radius, 14 in. Maximum distance of the spindle from the baseplate is 4 ft. 2 in.,



minimum distance, 2 ft. The arm can swing around the column continuously in a complete circle. With sensitive feed the machine will drill up to $\frac{1}{2}$ in., and with power feed, $\frac{3}{4}$ in.

Drilling Machine, Crankshaft Oil-Hole

F. Pollard & Co., Ltd., Leicester, England. (Vol.77,p.737E.)

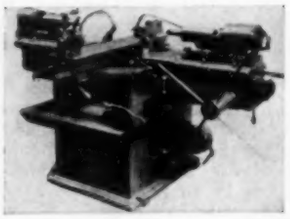
The machine is large enough to take a crankshaft 72 in. long. The main spindle is driven by motor through Tex-rope and the feed is by a star wheel. The table will swivel and is graduated to indicate angles. Longi-

tudinal movement of the table is obtained by rack and pinion. Various positions of the different crankshaft throws are obtained with spacing bars, the plunger for this purpose being operated by the horizontal shaft at the front.

Drilling Machine, Crankshaft Oil-Hole

J. Holroyd & Co. Ltd., Milnrow, near Rochdale, England. (Vol.78,p.117E.) F-78.

Holes up to $\frac{3}{4}$ in. can be drilled For long holes the two drill heads move forward simultaneously by cam action. Because of the shape of the cams, when the drill points approach one another at the center, one head withdraws and the other feeds forward to complete the hole before returning to the starting point. For angular hole work the fixture can swivel 45 deg. each side of the cross position.



Drilling Machine, Multiple-Spindle, Special

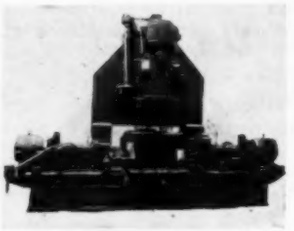
F. Pollard & Co., Ltd., Leicester, England. (Vol.78,p. 614E.) F-228.

Brake shoes and linings are drilled on this seven-head machine. The main spindle of each is fitted with a two-spindle head so that 14 holes can be drilled simultaneously. Adjustable spindles allow holes to be drilled in pairs or in irregular spacings. The time cycle for drilling linings is 2 sec. each.

Drilling and Tapping Machines, Four-Way

F. Pollard & Co., Ltd., Leicester, England. (Vol.77, p.736E.) F20C.

The machine illustrated has 107 spindles varying in diameter from $\frac{7}{8}$ to $1\frac{1}{4}$ in. Each multiple



head is carried on a self-contained unit, with separate motor drive to the unit, the actual feed to the spindles being by a cam which provides a quick approach, slow drilling movement, and a quick return. The similar machine is for tapping 97 of the holes drilled by the machine illustrated.

Drilling Machine, Multiple-Spindle, Special

F. Pollard & Co. Ltd., Leicester, England. (Vol.77,p.736E.)

This machine was especially designed for drilling simultaneously all the holes in brake linings and aluminum brake shoes. It has eight self-contained spindles, each carried on a separate head and driven direct by its own constant-speed motor. In the case of the two outer spindles, each has an attachment carrying a two-spindle head, to provide for drills opposite each other at the ends of the liners. The other spindles are staggered to produce rivet spaces on both sides of the center.

Forging Machines

Forging and Trimming Machines, Bolt, Greenbat

Greenwood & Batley, Ltd., Leeds, England. (Vol.38, p.615E.) F-231.

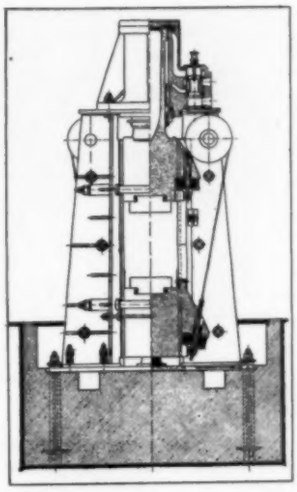
This solid-die double-stroke cold forging machine is for manufacturing $\frac{1}{4}$-in. B. S. F. "cheesehead" bolt blanks with $1\frac{3}{4}$ in. shanks direct from a coil of $\frac{3}{8}$-in. steel wire having a tensile strength of 30 to 35 tons. The cut-off is actuated by the first movement of the camslide. The blank is then pushed into the die and the cut-off slide returns to its original position while the head is being formed. Ejection of the headed workpiece is effected by a knockout mechanism. Wire is fed into

the machine by a pair of grooved feed rolls, positively driven. In the event of a serious jam the flywheel may slip. The trimming machine is for trimming the ⅜ in. cheesehead blanks to a ⅜ in. B.S.F. hexagon head, but other shapes can be produced.

Hammer, Double-Swage

Leo C. Steinle, Ltd., Marsham St., Westminster, S. W., England. (Vol.78,p.678E.) F-283.

The Bêché double-swage hammer has two tups of the same weight striking against each other at the same speed. The upper tup is driven in the usual way. The movement is imparted to the lower tup through flexible belts consisting of a series of steel bands superposed and working over a pulley on each side of the hammer. A



resilient connection is provided between the band and tup by a series of rubber disks. The tups are guided at the four corners and are adjustable. The whole construction is designed for working with several swages. The hammer exhibited gives an effective blow of about 29,000 ft.-lb. The blows per minute range from an average of 16 to a maximum of 80.

Gear-Cutting and Finishing Machines

Gear Generating Machine, Straight and Spiral-Bevel

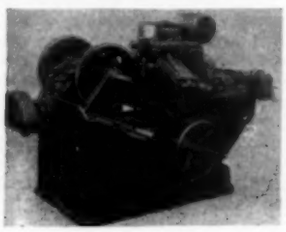
Benrath Machine Tools, Manchester, England. (Vol.78, p.618E.) F-235.

This Heidenreich & Harbeck Rapid bevel-gear generating machine is for cutting straight teeth and also right and left-hand spiral teeth at any required spiral angle. The capacity is from ⅜ to 8 in. pitch circle diameter, and the machine makes 400 strokes per min. For production work the machine can be set so that two tools gash two teeth at a time, the dividing advancing the gear blank by two teeth. By pushing a knob the machine will immediately divide only one tooth, so that each tool finishes one flank; that is, one tooth is finished at a time. The machine can cut bevel gears at 20-deg. pressure angle with tools of 14½ deg. pressure angle. Four larger machines are built for gears up to 40 in. diameter.

Gear Planer, Double-Helical

J. Parkinson & Son, Shipley, England. (Vol.78,p.659E.) F-270.

In the No. 23 Sunderland double-helical planer the teeth produced are of the continuous type without interruption by a central gap or groove. The right- and left-hand sides of the gear are cut simultaneously, and are concentric with each other. The cutters, operating in pairs, one for each hand of helix, move alternately from the edge of the center of the face of the blank along straight guides at an angle of 30 deg. Each cutter clears the way for the other when cutting continuous teeth. In addition, the machine can be

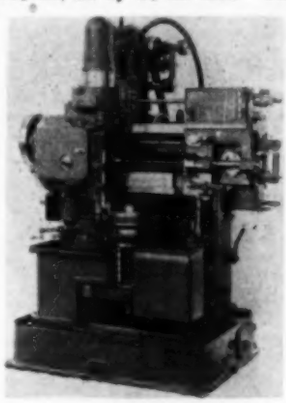


arranged to cut interrupted or staggered teeth. The machine will cut gears up to 24 in. outside diameter and the maximum width of face is 4 in. The maximum pitch is 4 d.p.

Gear Shaper, Automatic, Lorenz

A. C. Wickman, Ltd., Coventry, England. (Vol.78, p.635E.) F-247.

The Lorenz automatic gear shaper operates on the Fellows principle, to cut external spur gears up to 17¾ in. diameter and helical gears to 16½ in. in diameter, internal spur gears up to 17½ in., and helicals up to 16½ in., all by 2¾ in. face. The

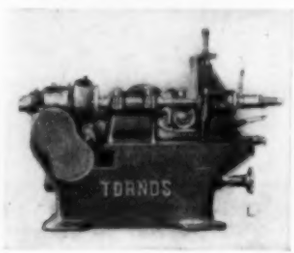


maximum pitch cut in steel is 5 d.p. The gears may be cut by one, two or three cuts in one setting. When the cutting cycle is completed, the carriage withdraws automatically from the work and the machine stops. The ram speeds are from 62 to 350 strokes per min., and eight cutter feeds are provided.

Gear Hobbing Machine

L. O. Adam, 6 Nicoll Road, Harlesden, N.W., England. (Vol.78,p.320E.) F-145.

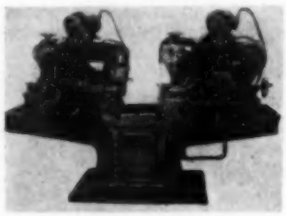
This hobbing machine, made by Usines Tornos, Moutier, Switzerland, cuts spur teeth on small pinions integral with their shafts or on gear wheels mounted in batches on a work arbor. The machine deals with gears up to 2¾ in. in diameter by 25 d.p., the maximum travel of the hob being 1½ in. Drive for the hob is taken from the cone-pulley shaft. Interchange of work arbors is facilitated by having the work driving worm wheel contained in the casing, but not connected permanently to the work spindle.



Chamfering Machine, Gear-Tooth

Hey Engineering Co., Ltd., Coventry, England. (Vol.77, p.726E.) F-17.

For chamfering the gear teeth of synchromesh gear boxes, in this machine the gear being chamfered constantly revolves and the shaping of the chamfering or rounding is controlled by cams, which enable single chamfers, double cham-

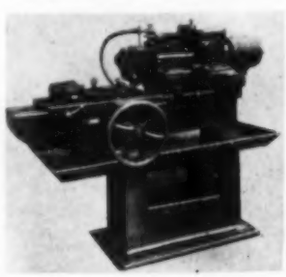


fers, or circular action to be performed on the teeth in one operation. In addition, any angle can be produced. The machine has a high-speed horizontal milling spindle and a vertical attachment can be supplied. The combination of the two will enable internal and external teeth of any number to be cut, the cycle being automatic until completed. The output is 30 teeth, 8 D.P., in 70 sec. The tooth-rounding fixture is a self-contained mechanism with its own motor drive.

Chamfering Machine, Gear-Tooth

J. Holroyd & Co., Ltd., Milnrow, near Rochdale, England. (Vol.78,p.350E.) F-152.

Ring gears are automatically chamfered on this machine, the minimum and maximum diameters taken being 13¾ and



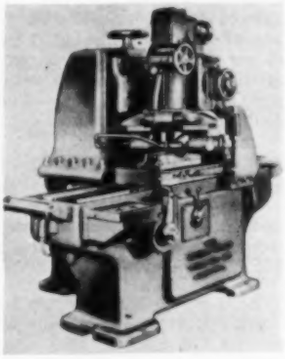
20½ in. Each gear is automatically indexed from its own teeth by a ratchet motion with dividing plunger. A bevelled milling cutter is employed. The driving motor is of 1 hp., and the cutter spindle makes 68 r.p.m. The feed cam makes 1 rev. in 5 sec., and 12 teeth are chamfered per min.

Gear-Finishing Machine

G. E. Marbaix, Ltd., Vincent Square, London, S.W., England. (Vol.78,p.664E.) 278-A.

The machine will work on

gears from 2 in. diameter with ¼ in. face to 8 in. diameter by 2 in. face. It is entirely automatic. It functions by the use of a horizontal cutting rack to which the work is fed by a hydraulically controlled head. The gear is mounted on an arbor, or between centers, and travels over the cutting rack a predetermined number of strokes from 1 to 50. The use of two arbors, one being loaded while the other is in the machine, enables continuous production. The cutting racks are built up of serrated segments, and by a system of inspection are held to a maximum tolerance of 0.000025 in. From 20



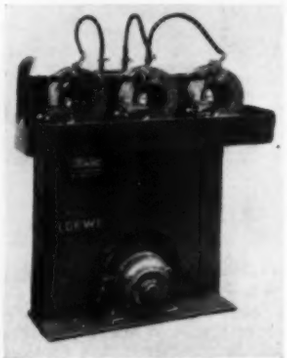
to 25 re-grinds are usually obtained from each rack.

Grinding Machines

Grinder, Cemented-Carbide

Stedall - Dowding Machine Tool Co., 157 St. John St., Clerkenwell, E.C., England. (Vol.78,p.25E.) F39.

This "Wunderli" grinder for small, medium and large tools tipped with tungsten-carbide is built in three sizes. The smallest will accommodate turning tools up to 6 in. long; medium machine, tools up to 11 in. long; the largest, tools up to 14 in. long. All sizes employ a dia-



mond cup wheel 5⅞ in. in diameter. The spindle may be run in either direction for right or left-hand grinding. The toolrest is a large flat table which may be tilted 12 deg. from the horizontal. An oscillating motion to the table enables tools to be reciprocated across the face of the wheel. This action prevents the formation of grooves in the face of the wheel.

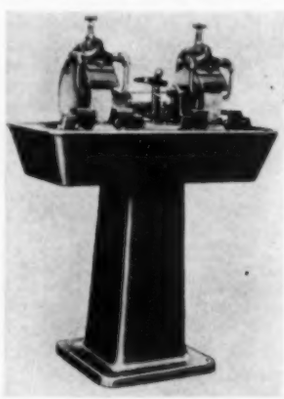
Grinder, Tool, Cemented-Carbide

G. H. Alexander Machinery, Ltd., Coleshill St., Birmingham, England. (Vol.78,p.100E.) F-70.

This Loewe tool grinder has three wheels, two of which are corundum and carborundum, with finish-grinding by a third wheel of carborundum. For an exceptionally smooth surface the third wheel may be either of close-grained cast iron or of silicon carbide. The body of the machine is welded. Wheels are placed at 14 in. center distance and each runs at 1,900 r.p.m. Wheel spindles run in ball bearings. Work rests are adjustable to compensate for the wheel wear. The tool rests swivel and are graduated so that the main tool angles can be produced readily.

Grinder, Tool, Two-Wheel

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.210E.)

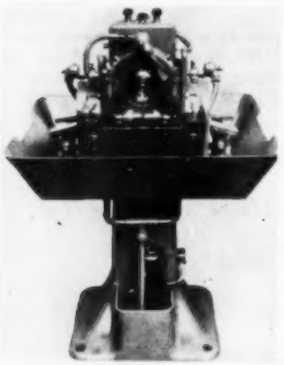


Built by the Lumsden Machine Co., Ltd., Gateshead, this two-wheel grinder will take tools with tips of high-speed steel or tungsten - carbide. Wheels for roughing and finishing are provided. Grinding is done on each face of each wheel; the wheels run towards the cutting edges of the tools and are therefore recessed on each side so that tools of any shape can be ground without reversing the direction of rotation of the spindle. A work rest is provided on each side of each wheel.

Grinder, Tool, Four-Wheel

Cromwell Engineering Co. (Coventry), Ltd., Coventry, England. (Vol.78,p.227E.)

Cutters of all types, including those of high-speed steel and tungsten-carbide, can be ground. The machine has four double-cup wheels, 8 in. in diameter, and placed at right



angles to each other. Each spindle is driven at 2,800 r.p.m. by reversible motor. One face of each wheel being worn down by use, it can be reversed on the spindle so that the other face can be similarly used. Tool rests are provided for both sides of the face of each wheel, to suit right and left-hand tools, and each rest can be adjusted for angle.

Grinder, Cutter

Selson Machine Tool Co., Ltd., Abbey House, Victoria St., Westminster, S.W., England. (Vol.78,p.206E.) F-105.

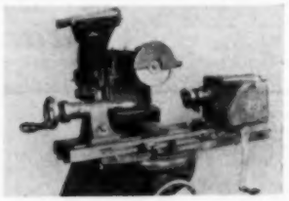
The cutter head grinder built by Werkzeugmaschinenfabrik, Union, Chemnitz, is a single-purpose unit for right- and left-hand multi-cutter heads from 6 to 39⅜ in. in diameter. The cutter heads are set up on a vertical axis by means of a mandrel or a self-centering chuck. In the grinding operation the rotating wheel oscillates through a flat arc about 1,300 mm. radius, around a fixed swivel pin. The column supporting the swiveling grinding motor is attached to a swinging table. Stroke of the table is effected by a special crank drive that ensures smooth re-

turn. Face-cutting edges obtain their cutting angle automatically by virtue of the arc-shaped swinging movement of the rotating grinding disk. For grinding the cutter edges on the circumference the wheel is set vertically and the cutter head adjusted to the cutting angle required by the application of a templet.

Grinder, Hob and Cutter

A. A. Jones & Shipman, Ltd., East Park Rd., Leicester, England. (Vol.78,p.609E.) F-220.

This grinder has been designed for sharpening hobs and form cutters by grinding in the flutes of either spiral or straight-cut teeth. The table is fitted with a graduated swivel slide. The workhead is arranged with

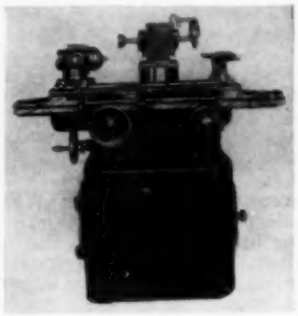


indexing mechanism and rotary motion variable to suit any required lead of spiral. It is operated from the table traverse gear through change gears. The machine can operate on cutters up to 8 in. in diameter; the maximum table traverse being 13 in. The lead may be from 3 to 133⅓ in., and the helix or lead angle from 0 to 30 deg.

Grinder, Tool and Cutter, Universal

Selson Machine Tool Co., Ltd., Abbey House, Victoria St., Westminster, S.W., England. (Vol.78,p.392E.) F-163.

Manufactured by J. Kamenicek & Co., Prague, Czechoslovakia, this grinder will deal with usual cylindrical, internal and surface grinding of toolroom nature and special attachments are available for sharpening long fire-box taps. The table movement is sensitive, the supports consisting of rollers with ball bearings to act as guides. The table is of compound type for taper grinding. Swing of the table, 10 in.; length between headstock and



tailstock, 21½ in.; between right- and left-hand tailstocks, 26½ in.; working surface of table, 36x5½ in.; longitudinal traverse, 17½ in.; cross traverse, 10 in.; vertical adjustment of wheelhead, 7½ in.; greatest distance from wheel spindle to table, 10 in.

Grinder, Spur Gear Cutter

J. Parkinson & Son, Shipley, England. (Vol.78,p.617E.)

This hand-operated sharpener for spur gear cutters up to 10 in. long is driven by a ½-hp. motor. The operator traverses the

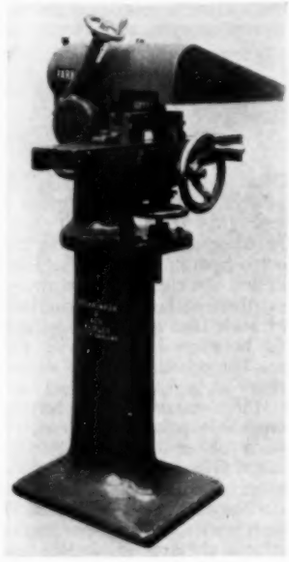


table by hand. The table measures 28½ in. x 5 in., and traverse is 16 in. Greatest distance from the center of the spindle to the table, 80 in.; end movement of the spindle head stock, 3½ in.

Grinder, Spur Gear Cutter

J. Parkinson & Son, Shipley, England. (Vol.78,p.617E.) F-233B.

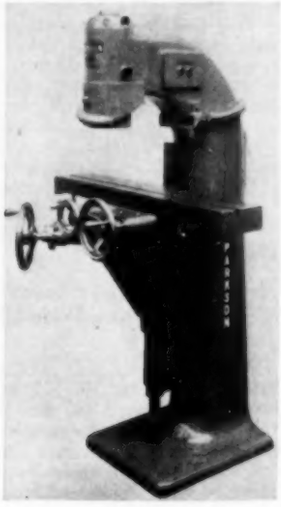
This machine will sharpen and pair-up spur cutters, both finishers and bottom-cutting tools, face grind double-helical cutters, and pair the ends and backs of double-helical cutters. Driven by a 6-hp. motor. Working surface of the table, 31½ by 8 in.; and table travel, 25½ in.

by hand; vertical movement of table, 4¼ in.; cross movement, 4 in.

Grinder, Double-Helical Cutter

J. Parkinson & Son, Shipley, England. (Vol.78,p.617E.)

This machine is for lipping and chamfering double-helical cutters. It has an electrically driven vertical spindle which carries a 6 in. cup wheel. The table has 21 in. longitudinal travel by handwheel, 6 in. cross

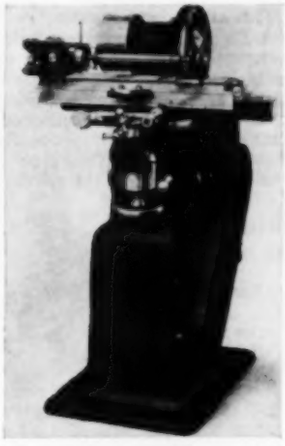


movement, and 15 in. vertical movement. Cutters are clamped on a sliding block which is moved, tooth by tooth, on the dovetailed ways on the fixture base, the teeth being located by a sliding plate with a V-notch.

Grinder, Tool and Cutter, Universal

Stedall - Dowding Machine Tool Co., St. John St., Clerkenwell, E.C., England. (Vol.78, p.511E.) F-192.

This machine is built by J. G. Weisser Sohne, St. Georgen, Germany. Fixtures enable the grinding of all forms of tools, milling cutters, reamers, parallel or taper taps with straight or spiral flutes, cylindrical work, both external and internal, and also face and hollow grinding. A rotating pulley is available on the workhead and it may be



engaged for cylindrical grinding or disengaged when cutters are mounted between centers. The head may be of a chuck type for internal grinding, or with an expanding arbor for external grinding. The wheelhead may be swiveled up to 90 deg. on each side of the center. The work table may be clamped at any required height. Saddle may be swiveled for obtaining unusual angles not covered by the table swivel. The maximum grinding length between centers is 14 in., the largest swing between centers is 4 in. in diameter; longitudinal travel, 21 in. The vise swivels 90 deg. vertically and 360 deg. horizontally, the opening being 2¾ in.

Grinder, Circular-Saw

S. Russell & Sons, Ltd., Leicester, England. (Vol.78, p.630E.) F-239.

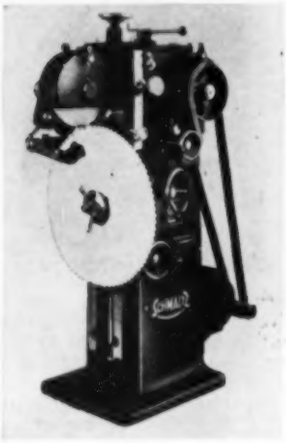
This electrically driven grinder for 15 to 40 in. inserted-segment cold saws, with tooth pitches from ¼ to 2 in., is a self-contained machine. The vise has

vertical and horizontal adjustment on the column, and a mandrel holds both templet and saw blade on carriers. The grinding wheel spindle is mounted on ball bearings, and an exhauster collects dust. Power requirements, 1 hp.

Grinder, Saw, Automatic

Dowding & Doll, Ltd., Greycoat St., Westminster, S.W., England. (Vol.78,p.206E.) F106.

The Schmaltz automatic saw grinder has two wheels that work in unison so that all cutting angles of heavy inserted-tooth saws are ground as each saw is rotated, without the necessity for wheel changes. One disk grinding wheel per-



forms the first operation of profile grinding the alternately high and low rough and squaring teeth, whereas a second disk wheel executes the second and third operations of bevelling the roughing teeth on both sides. The smallest saw admitted is 11¾ in., and the largest, 48 in. in diameter.

Grinder, Drill

Jones & Shipman, Ltd., Leicester, England. (Vol.78, p.641E.) F-258.

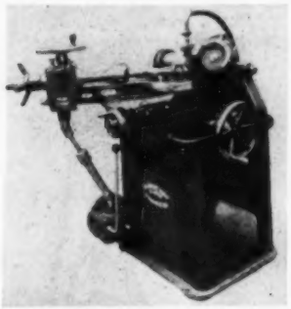
The "Perfect Point" twist drill grinder is now of larger capacity. The drill holder is clamped to a slide, and takes the drill to the wheel and back. with three holders the range is from ⅛ to ⅝ in. drills. Both parallel and taper-shank drills can be taken. The spindle car-

ries the cupped wheel 9½ in. in diameter by 1½ in. face by 1¼ in. hole on the right-hand for drill sharpening, while on the left-hand a disk wheel 8½ in. in diameter by ½ in. face by 1 in. hole is used for roughing, or a 6-in. saucer wheel for point-thinning. A setting gage for the drill is provided. Over-all the machine measures 32x24x19 in. high, and weighs 300 lb.

Grinder, Drill

Herbert Hunt & Sons, Old Trafford, Manchester, England. (Vol.78,p.589E.) F-250C.

Six machines are built for sharpening drills from 0.015 in. to 4 in. in diameter, and these machines are operated either by hand or automatically. The drill is held by a self-centering chuck which will grip either taper or parallel shanks. The point is held in a bushing that revolves



during grinding. Clearance is given by cam action. Varying cutting angles from 90 to 180 deg., and also drills with two, three or four lips can be ground. Point-thinning is accomplished by a movement of the cross-slide which positions the drill under the thinning wheel.

Grinder, Drill

Thos. Firth & John Brown, Ltd., Sheffield, England. (Vol. 78,p.605E) F-216.

Drills from $\frac{1}{16}$ to $\frac{1}{2}$ in. in diameter can be ground. Machine is available as a bench or pedestal type. The drill is set to a stop and bushings are pro-

vided for all sizes within the capacity of the machine. The work holder can be adjusted to grind points at from 180 deg. to 60 deg. included angle.

Point-Thinning Attachment, Twist Drill

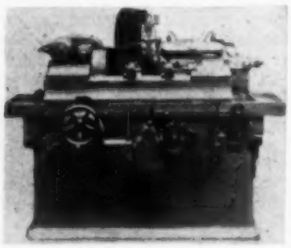
Jones & Shipman, Ltd., Leicester, England. (Vol.77,p. 684E.) F-5.

This attachment for the "Perfect-Point" twist drill grinder is designed to thin the points of drills from $\frac{1}{16}$ to $\frac{1}{2}$ in. in diameter. Three wheels are provided to cover the range mentioned. Each wheel is independently mounted on its own flange plate which fits the end of the spindle.

Grinder, Plain, 10 by 20 In.

Churchill Machine Tool Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p. 659E.) F-269.

This plain grinder operates on either the traverse or plunge-cut grinding method. The wheel spindle takes a balancing type grinding wheel collet. Standard size of grinding wheel, 20 in. by 2 in. by 10 in., but

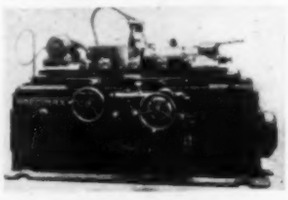


wheels up to 10 in. wide can be carried for plunge-cut work. The table is in two sections, the top part, pivoted at the center, being swiveled for grinding tapers up to an included angle of 9 deg. Traverse speeds range from 6 to 240 in. per min. On stopping the workhead a dynamic brake arrests the rotation of the work.

Grinder, Plain, Precimax

John Lund, Ltd., Cross Hills, near Keighley, England. (Vol. 78,p.335E.) F-151.

Two standard sizes, both to grind 6 in. in diameter are built, one with the normal grinding length of 24 in., and the other a grinding length of 36 in. Centralized control is furnished for each machine, and they now have both straight-in plunge-cut feed, hydraulically operated, and in-



termittent feeds at each end of the stroke. Further, an hydraulically operated quick approach and receding motion of 1 in. to the wheelhead is furnished. The grinding wheel is 20 in. in diameter by 2 in. wide. Work speeds, 40 to 400 r.p.m.; table speeds, 6 to 240 in. per min.; feed range 0.0001 in. to 0.001 in. by increments of 0.0001 in., and 0.04 in. per rev.

Grinder, Universal, Hydraulic

Burton, Griffiths & Co. Ltd., Birmingham, England. (Vol. 78,p.657E.) F-266.

This Landis hydraulic grinder is fully universal, both workhead and grinding wheel head swiveling up to 90 deg. on each side of center. The table also has a swiveling movement. The dwell at the reversing point is accomplished hydraulically and may be regulated by a needle valve.

Hydraulic motion for the table is effected by twin cylinders so that the volume of oil is constant regardless of the direction of travel. Table speeds range from 12 to 144 in. per min. The hydraulic automatic wheel feed mechanism is operated by a small piston at the rear. Eight work speeds are obtained by changing pulleys. The machine grinds 14 in. in diameter. Maximum swing with water guard removed, 15 in.; maximum distance between centers, 36 in.; table swivels to grind, 18 deg. included angle; size of the grinding wheel, 14 in. diameter by $1\frac{1}{4}$ in.; range of work speeds, 50 to 440 r.p.m.

Grinder, Roll

H. A. Waldrich G.m.b.H., Siegen, Germany. (Vol.78,p. 85E.) F-64.

This roll grinder will take a maximum diameter of $15\frac{3}{4}$ in. and lengths up to 5 ft., and is suitable for grinding parallel, concave and convex rolls. The work may be done between dead centers or with the use of fixed

stays incorporating a measuring and setting attachment as illustrated. The grinding head is fixed, the work being carried on a table which reciprocates on slides in front of the wheel. The machine is fully automatic and driven by three independent motors. Eight speeds are provided in geometrical progression from 7.5 to 90 r.p.m.

Grinder, Roll

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.78,p.429E.)

Rolls for the paper trade from 6 to 72 in. in diameter, and up to 23 ft. 6 in. long, can be

ground on this machine. The sole plate under the roll driving head is extended so that a 90 in. face roll can be ground in any position along the length of the machine bed. The grinding head has a traverse slide with fine adjustment for the wheel feed. Spindle drive is by a 20-hp. motor. The roll itself is driven by a 15-hp. slip-ring motor. Camber can be regulated. With a bed 35 ft. 6 in. long, the weight of the machine, exclusive of electrical equipment, is 26 tons.

Grinder, Roll, Hydraulic

H. A. Waldrich, G.m.b.H., Siegen, Germany. (Vol.78, p.393E.) F-164.

Hydraulic drives are provided for the rotation of the roll and the feed motion of the wheel in this grinder. The illustration shows a machine taking 197 in. between centers, and accommo-

dating rolls up to $35\frac{1}{2}$ in. in diameter. The oil gear gives a speed range from 0.5 to 30 r.p.m. The wheel carriage receives the electro-hydraulic feed mechanism and the electric wheel drive. Together with a backgear, the hydraulic feed gear provides any feed between $\frac{1}{4}$ and 70 in. per min. The wheel spindle is driven either by a variable-speed d.c. or three-phase motor having changeable pole connections, by means of endless multiple V-belts. Grinding may be done either between dead centers or with the roll necks supported in steadyrests. Concave or convex surfaces are ground to close tolerances by a cam-controlled attachment.

Grinder, Roll, 40-In.

Craven Bros (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.590E.) F-207.

This machine is designed for rolls for the sheet and tinplate trade. Maximum and minimum diameters ground are 40 and $4\frac{1}{2}$ in., respectively, the maximum length 7 ft., and the maximum length between centers, 10 ft. With a special chamfer-grinding rest, a roll can be completely

finished at one setting. The saddle has reversible power traverse. Drive to the spindle is by belt from a motor mounted on the rear of the grinding slide. The roll revolving head is motor driven through change gears with the final drive by a worm.

Grinder, Roll, 40-In.

Stedall - Dowding Machine Tool Co. Ltd., St. John St., Clerkenwell, E.C., England. (Vol.78,p.680E.) F-288.

This Naxos-Union 40 in. roll grinder will take rolls up to 138 in. long. Maximum weight of work taken, 44,000 lb. The machine can be arranged for grinding any profile of cambering. Longitudinal speeds of the grinding wheel carriage range from 4 to 60 in. per min. Wheel feed toward the work is by hand or

automatically. By hand control a pressure lever allows a feed of 0.0001 in. on the diameter per stroke. The automatic feed may be adjusted in increments from 0.0001 in. to 0.004 in. on the diameter. For polish-grinding there is a micrometric fine feed independent of the ordinary feed to allow advance of the wheel by 0.00002 in. or less. Drive to the wheel spindle is by a 30-hp. motor. Work rotation can be regulated between 6 and 48 r.p.m.

Grinders, Centerless, Lidköping

A. C. Wickman, Ltd., Coventry, England. (Vol.77,p.756E.)

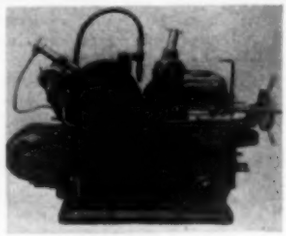
The above company is representing Lidköpings Mekaniska Verkstads A.-B., Lidköping, Sweden, for centerless grinders. The machines are available in four sizes, the smallest of which will grind down to 1/32 in. in diameter and admit 2¾ in. in

diameter as a maximum, while the largest will grind down to ¾ in. in diameter and admit 10 in. diameter. A bearing is used on each side of the grinding and regulating wheel, the latter being positively driven to ensure uniform rotary motion. Both wheels are adjustable in relation to the work, and no transverse adjustment of the latter is necessary. Also, work-feeding attachments in fixed positions can be used.

Grinder, Centerless, No. 2

Churchill Machine Tool Co. Ltd., Broadheath, near Manchester, England. (Vol.78,p. 638E.) F-251.

Two methods of grinding are applicable. For the through-feed method the axial movement of the work past the grinding wheel is imparted by the control wheel. The latter may be set over at an angle relative to the grinding wheel from zero to 10 deg. for regulating the work



traverse speed. For the infeed method the control wheel is withdrawn to allow the insertion of the workpiece, and then with the work in position on the rest, the control wheel is moved towards the grinding wheel until limited by a stop. With standard through-feed workrest, this machine will take work up to 3 in. in diameter by 9½ in. long and special rests may be furnished for short pieces from 2 to 4 in. diameter. If necessary, work up to 15 ft. long and diameters down to ⅛ in. can be ground.

Grinder, Centerless, Scrivener

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.617E.)

This Scrivener centerless grinder has an all-electric drive and deals with work up to ½ in. in diameter by 4 in. long for infeed grinding. The wheel-truing device has two diamonds, one mounted on each side of the arm which is lowered into position to true both grinding and control wheels. The arm is adjustable 15 deg. each way for dressing wheels for grinding tapers. A friction damper ensures smooth running. For shoulder grinding the work is placed on the rest with the grinding wheel withdrawn, the control wheel is fed forward by lever and the piece ground and automatically ejected.

Grinder, Centerless, No. 12

B.S.A. Tools, Ltd., Birmingham, England. (Vol.78,p.654E.)

The No. 12 centerless grinder will grind diameters between ¾ and 5½ in. Power required, 15 to 20 hp. The control wheel is a fixed member, the grinding

wheel-head being adjusted. For straight-through work the head is set by micrometer handwheel and for shoulder and taper work the setting of the head is by infeed method. For wheel dressing slides are provided on top of the control wheel spindle body. By means of a cross-slide the diamond holder can be adjusted between the two wheels, while a longitudinal slide enables the holder to be moved backwards and forward across the faces of the two wheels. Both are trued from the same slide and at the same setting so that a parallel path for the work is ensured.

Grinder, Internal and Face

A. C. Wickman, Ltd., Coventry, England. (Vol.78,p.99E.)

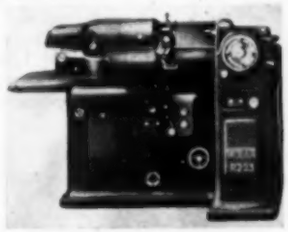
This "Specima" internal and face grinder built by Fortuna Werke, Stuttgart - Cannstatt, Germany, will hold work up to 20 in. external diameter. Bores, parallel or taper, 16 in. in diameter by 16 in long can be ground. Face grinding up to 14 in. external diameter and 12¾ bore diameter can be undertaken.

The workhead, internal spindle, and the face grinding spindle are each driven by independent motors. The work headstock is carried on a table which can be reciprocated by hand or hydraulically and can be swiveled to 20 deg. for conical grinding. The carrier for the internal grinding spindle is mounted on a double slide. By the upper slide the spindle can be adjusted by hand and gearing to the diameter of the work and compensation is made for wheel wear. Rapid cross-feed movement and the fine feed are effected by the lower slide. Table speeds range from 4 in. to 39 ft. per min.

Grinder, Internal, Automatic

Soag Machine Tools, Ltd., 45 Horseferry Road, Westminster, S.W., England. (Vol.78,p.100E.)

This machine is built by Wotan- und Zimmermannwerke A.-G., Glauchau, Germany. All operations for internal grinding, including measuring, are performed automatically. The internal grinding spindle is driven through an intermediate countershaft by a woven silk belt,

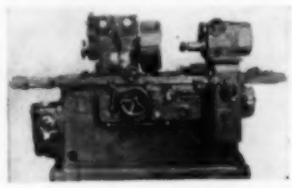


while the work-spindle is driven from a self-contained three-speed countershaft. The work-head can swivel to 15 deg., and angles up to 30 deg. can be obtained. The grinding head is adjustable on the cross-slide and may be set according to the size of bore. Cross feed of the head is effected through planetary gearing which permits a large ratio between the feed handwheel and the spindle. The hydraulic automatic feed can be varied from 0.001 to 0.007 mm. measured on the diameter. Maximum stroke of the table is 14⅛ in.; largest workpiece admitted, 9⅞ in. in diameter; swing over table, 19⅛ in. diameter; largest bore ground, 4 in. in diameter; maximum grinding depth, 4 in.

Grinder, Internal

K. Jung, Berlin, Germany. (Vol.78,p.132E.) F-87.

Both cylindrical and tapered and end-to-end or interrupted holes can be ground with table motion, and the machine can be used for plunge-cut grinding when the table is stationary. The drive incorporates a built-in motor and the headstock can be swung through a wide angle for grinding internal cones. Movement of the spindle is controlled by an hydraulically driven cam. The table drive is



hydraulic. Minimum bore ground is 1 5/16 in.; maximum bore, 9 7/8 in.; maximum swing of guard, 13 3/8 in.; work spindle speeds, 8; normal range 48 to 300 r.p.m., minimum table stroke, 13/64 in.; maximum grinding length with normal headstock, 7 7/8 in., or with hollow spindle head, 13 3/8 in.: maximum table speed, 40 ft. per min.

Grinder, Surface, Rotary

John Lund, Ltd., Cross Hills, near Keighley, England. (Vol. 78,p.663E.) F-277.

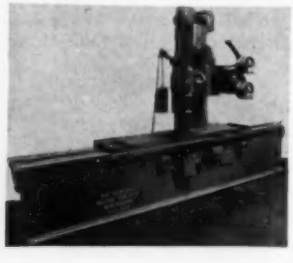
This rotary surface grinder will take work 20 in. diameter as a maximum, the maximum thickness admitted under a new wheel being 6 in., and the wheel itself being 18 in. diameter by 2 in. thick. It is driven by a 12 hp. variable-speed motor. Speeds are 500, 1,000 and 1,500 r.p.m. The wheelhead traverse is from 6 to 240 in. per min.,

and the intermittent up-feed to the table is hydraulically operated within a range of 0.00025 in. and 0.001 in. The grinding head reciprocates automatically until the work is sized. A pin on a dog is then lifted, allowing the head to recede at high speed to the loading position. The machine is fitted with a magnetic chuck and weighs 3 1/2 tons. A size suitable for work up to 24 in. in diameter is also available.

Grinder, Surface, Slideway

Churchill Machine Tool Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p. 272E.) F-130.

Built for correcting machine tool ways and slides of all types, this grinder has a table 72 in. long by 17 1/2 in. wide, and will admit 30 in. between the table and wheel. The table is traversed hydraulically at speeds up to 50 ft. per min. The motor driving the grinding wheel spindle is built into the head, the armature being mounted directly on the

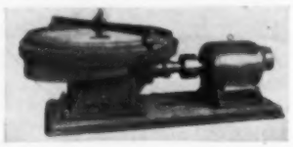


grinding wheel spindle. On the head is a bracket with double facings for the attachment of angular setting gages, which are used with a precision level for extremely accurate settings, as when grinding mating angular surfaces.

Grinder, Disk, Horizontal

Geo. Jackman Machine Tool Co., 52 High Holborn, London, W.C., England. (Vol.78,p. 590E.) F-206.

This 53 in. diameter horizontal disk grinder is driven by a 10- or 20-hp. motor direct through a flexible coupling. The disk speed is 480 r.p.m. The grinding member is a 1 in.

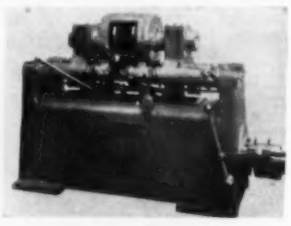


thick corrugated disk made in six sections and secured to the disk by countersunk screws. Practically the full thickness of the abrasive can be used. A self-contained wheel dressing device is provided. Floor space, 8 ft. 9 in. by 5 ft. 9 in.; net weight, 5,000 lb.

Grinder, Disk, Duplex

Geo. Jackman Machine Tool Co., 52 High Holborn St., London, W.C., England. (Vol.78,p. 689E.) F-285.

This 12-in. duplex disk grinder has a maximum opening between the disks of 10 in., but when using ring wheels the maximum opening is 4 in. The work is placed between the disks



and the wheelheads, which slide on twin cross bars, and are brought together by a hand lever to a positive stop. Corrugated grinding disks or 10 in. ring wheels are used. In the latter case the work is fed between the wheelheads which are clamped in position.

Grinder and Returning Machine, Axle-Journal

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.540E.) F-196.

This machine will grind both journals and the radial curves, simultaneously or independently,

of carriage and wagon wheels with the wheels assembled. It admits wheels up to 3 ft. 7 1/2 in. diameter on the tread, axles up to 7 ft. 6 in. length by 4 ft. 8 1/2 in. gage. The journals may vary from 3 1/2 to 5 in. in diameter and from 8 to 10 in. long. The wheel sets can be rolled directly into the machine and lifted into position. Turning rests are arranged at each end of the machine. The top slide carries two tools, and each slide has hand feed. The grinding heads are carried on transverse slides on the saddles, and each spindle is driven by a 15-hp. motor. The saddles give 12 in. traverse. Net weight, 10 1/4 tons.

Grinder, Band-Type

Wearden & Guylee, Ltd., Bradford, England. (Vol.78,p. 9E.) F-35.

This band grinder can be used either vertically or horizontally, and either on a bench or mounted on a stand. The drive may be by belt from a lineshaft or by a motor which may be placed inside the pedestal. For

the motor drive a V-belt and pulleys giving two speeds are used. The machine is available in two sizes, one with the grinding table 20 in. by 8 in.; the other table, 25x10 1/2 in.

Grinder, Camshaft, Precision

Stedall - Dowding Machine Tool Co., St. John Street, London, E.C., England. (Vol.78,p. 147E.) F-90.

Built by Naxos-Union, Frankfurt-on-Main, Germany, this machine will grind camshafts. Three sizes of machine are built, the only differences being that one will admit camshafts up to 29 1/2 in. long, the second up to 39 1/2 in., and the third to 47 1/2 in. In each instance the minimum radius of work is 1 5/16 in. The copying principle is employed and cams can be ground of all

shapes, with straight or convex flanks within the sizes admitted. Longitudinal movement from one cam to another is actuated by hand. A workhead on the swivel table will take a dead center and driving plate. The motor speed is varied automatically by a resistance synchronized with the table movement. The speed diminishes when the wheel grinds the top of the cam and increases as the back of the cam is in grinding contact. Thus, a nearly uniform peripheral speed is obtained on the whole face to be ground.

Grinder, Crankpin, Hydraulic

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.678E.)

This Norton crankpin grinder has a double-ended motor mounted at the rear of the body. The motor drives the work-rotating unit from one end and the coolant and oil pump from the other end. A silent chain transmits power from the work-drive unit to a shaft running the full

length of the machine beneath the table. A sprocket and silent chain at each end carrying the drive to the workhead spindles. The lefthand head is fixed longitudinally, but is provided with lateral adjustment, while the right-hand head has longitudinal adjustment. All main motions are operated hydraulically. Maximum swing over the table is 17 in.; size of grinding wheel, 42 in. by width of pin ground, wheel-drive motor, 25 hp.

Grinder, Cycle-Axle

Jones & Shipman, Ltd., Leicester, England. (Vol.77,p. 699E.) F-12.

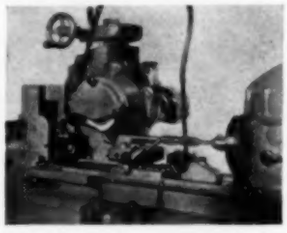
This machine produces the ball tracks on pedal cycle axles. It is a double-wheel machine with cam-operated motion to the wheelhead and hand traverse to the table. The two wheels are

spaced by a packing piece which can be arranged to suit different lengths of cycle axle. Each wheel is formed with a radius to suit the ball tracks. The table is reciprocated between micrometer dead stops to give the correct distance between shoulder and shoulder.

Grinder, Gear, Special Purpose

Gear Grinding Co., Ltd., Handsworth, Birmingham, England. (Vol.78,p.676E.) F-280.

This Orcutt gear grinder is made for large batches of small gears or stem pinions of spur type. The machine is fully hydraulic. Gears on mandrels and stem pinions are held between centers, and the dividing is



claimed to be practically instantaneous. To apply the cut an auxiliary table is raised on an incline, the taper being 1 in 32, so that a fine feed can be obtained. More than 10,000 gears have been ground without adjustments, the tooth shapes from the first to the last being within 0.0002 in.

Grinder and Lapper, Snap Gage

Sidney G. Jones, Ltd., 8 Balham Hill, London, S.W., England. (Vol.78,p.391E.)

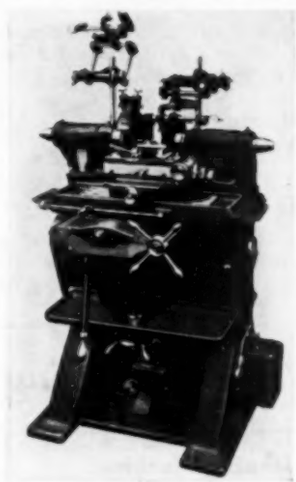
This grinder is designed for grinding and lapping the measuring faces of snap gages and is built by Fritz Studer, Glockenthal-Thoune, Switzerland. It will grind gages with double forks from $\frac{7}{16}$ in. to $3\frac{13}{16}$ in., and with single fork up to $7\frac{7}{8}$ in., the limit of accuracy being 0.00008 in. One machine has a wheel slide operated by hand and the other by automatic feed. The wheels are not fixed to a rotating shaft, but rotate with their

sleeves on a fixed shaft, to permit them to be driven at different speeds. The main table has longitudinal movement by handwheel for moving the work from one wheel to the other. Work-holding fixtures consist of one fixed and one movable slip located in the T-slots of the table. Travel of main table, $19\frac{11}{16}$ in.; of worktable, 2 in.

Grinder and Lapper, Snap Gage

Deutsche-Niles Works, Berlin, Germany. (Vol.78,p.450E.)

This grinder and lapper for external gages has only one automatic motion; that is, the reciprocation for grinding the flanks. All other movements are carried out by hand. A cross-slide on a knee receives its motion from an exchangeable heart-shaped cam. This drives a roller on a sliding bar. At the other end the bar has a small



crosshead with pin, and by this design no transverse stress is conveyed to the support. The stroke of the slide is controlled by adjustable dogs. On the table is an adjustable support also having cross-slides, the upper slide carrying the fixture for holding the external gage. Stress on the gage is avoided by the clamping means employed.

Grinder, Spline-Shaft, Hydraulic

Stedall - Dowding Machine Tool Co., St. John St., Clerkenwell, E.C., England. (Vol.78,p. 541E.) F-198.

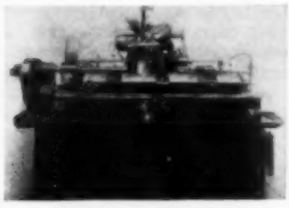
The Reinecker hydraulic spline-shaft grinder will grind the spline on all faces simultaneously by a full-profile wheel. The wheel truing device is brought into position automatically by a rapid table movement and the work is not withdrawn from center. Automatic traverse is affected hydraulically. Speeds, 8 in. to 26 ft. per min. Four bed lengths are available, the shortest provides a table length

of 63 in. for taking work up to $23\frac{1}{2}$ in., and giving grinding lengths up to $19\frac{1}{2}$ in., and the longest has a table length of 94 in., length of work up to 59 in., and grinding length up to 55 in. The grinding head slide has vertical movement on the column at the rear. The dividing head at the right-hand end of the table is actuated hydraulically. The work is indexed at every forward and return motion of the table. Height of centers, $6\frac{1}{8}$ in.

Grinder, Thread

Atkins (Peterborough), Ltd., Old Fletton, England. (Vol. 78,p.607E.) F-218a.

This thread grinder is suitable for gages, taps, leadscrews, and worms. The capacity is 4 in. in diameter by 20 in. grinding length. It takes 36 in. between centers. The design allows for increments of 12 in. The pitches ground are from 40 to 4 threads, or 20 threads to 1 thread per in., according to requirements. They are obtained by change wheels and a hardened and ground leadscrew and white-metal nut. It is claimed that work can be produced accurate to 0.001 in. Twelve work speeds

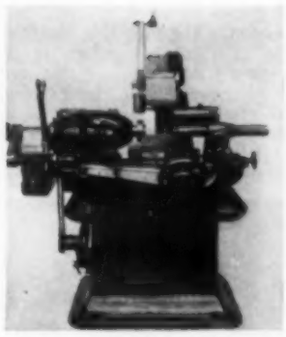


give a speed of 25 ft. per min., for diameters within the range of the machine. A feature is the diamond-feed mechanism. This is designed so that any amount taken off the wheel by the diamond automatically moves the wheelhead in relation to the work. It is, therefore, not necessary to reset the wheel after dressing. The wheelhead slides can be moved to give a helix angle up to 15 deg. each way. Feed cams are interchangeable.

Grinder, Tap-Thread

Atkins (Peterborough), Ltd., Old Fletton, England. (Vol. 78,p.607E.)

Capacity, $\frac{1}{2}$ to 1 in. by 6 in. between centers. Grinding length, $2\frac{1}{2}$ in.; maximum pitch, 8 per in. Sliding gears give relief for two, three or four flutes with a single-lift cam. The spindle is connected by gears to the circular traverse cam and required lead is given

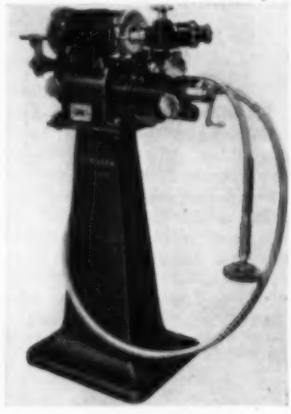


to the work by the movement of the work spindle, affording quick work return. The spindle does not reverse. The traverse cam also operates the automatic feed and the wheel drawback. Thirty-three work speeds are provided.

Grinder, Valve-Refacing

Grimston Electric Tools, Ltd., Lever St., London, E.C., England. (Vol.77,p.784E.) F32.

Three functions are performed: refacing valves up to $\frac{3}{8}$ in. shank; general grinding and tool grinding, and as a driving unit with a 10 ft. flexible



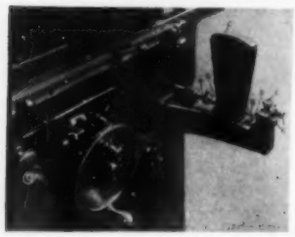
shaft for scratch brushing and sensitive drilling. At the left-hand end is located a tool grinding wheel with adjustable rest. At the right-hand end the valve grinding wheel is placed. The valve holder is carried on a horizontal bearing projecting from the side of the body. The valve has a rotary motion and also a reciprocating movement in line with the axis of the main motor. The holder is arranged to swivel at any setting between 15 and 75 deg.

Grinding Gage, Multi-Diameter

Churchill Machine Tool Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p. 430E.) F-169.

The gaging device has been introduced to speed up production on multi-diameter work. Can be set in a few seconds and while grinding is proceeding. Any number of diameters up

to 8 can be sized in quick succession. The principle on which the instrument operates is the accurate recording of the forward movement of the grinding wheelhead. A point on the indicator is set at zero when the first diameter has been accurately sized. In the grinding of

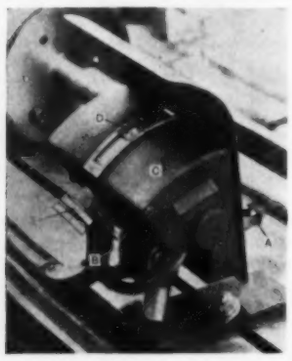


the successive steps or diameters, the traverse of the abutment plate is made so that the corresponding step on it comes opposite to the thrust pin on the indicator. This setting can be made speedily and then the feed can proceed until the pointer once again reaches the zero mark. The instrument slides on a bracket attached to the front of the bed.

Size Control, Cylindrical-Grinder, Automatic

John Lund, Ltd., Cross Hills, near Keighley, England. (Vol. 78,p.591E.) F-208.

The Precizer device controls automatically the size of work ground on cylindrical grinders, and operates the machine controls through a relay and solenoids when the required size has been reached. The device carries a diamond pointed finger *A*, which contacts with the work, and which can be taken out of position by means of lever *B*. A light on the machine



is switched on when the size is reached. A ray of light is passed across the inside of the casing *C*, and the interruption of this by the arm of the gaging pointer *D*, actuates the machine control. The size of the work is visible at *D*, as the grinding is proceeding, and the appliance can be used as an ordinary gage without the automatic control. Tolerances of 0.0005 in. can be guaranteed. A fine-thread screw *E* adjusts the position of the light gate.

Wheel-Truing Device, Centerless-Grinder

Burton, Griffiths & Co., Ltd., Birmingham, England. (Vol. 78,p.117E.) F-79.

B.S.A. Tools, Ltd., Birmingham, is the builder of this motorized wheel-truing device, for the No. 12 centerless grinder. Drive is by a ¼-hp. motor and it provides a constant traverse feed to the diamond across the wheel. It also has sufficient

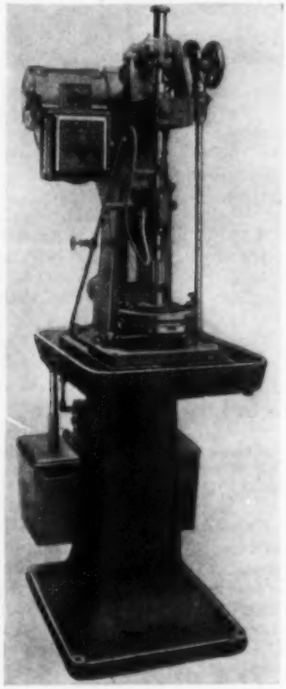
power to follow any ordinary form. The motor is mounted on the truing slide which in turn is placed on the control-wheel head.

Honing Machines

Honing Machine, Internal-Spline

G. H. Alexander Machinery, Ltd., Coleshill St., Birmingham, England. (Vol.78,p.677E.)

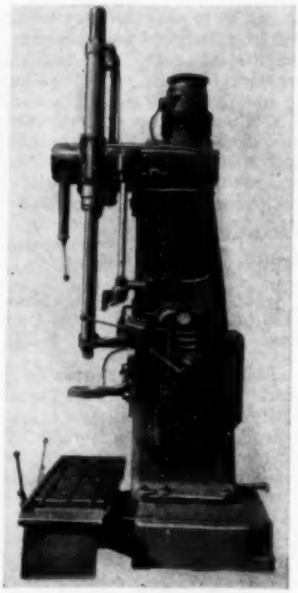
The Sunbeam internal spline honing machine is used for correcting the sides of internal splines in hardened steel parts. The correcting motion consists in reciprocating in the splined hole a hone of similar form to that of the splined shaft. Reciprocation of the hone spindle is obtained from the cross shaft through the medium of a slotted link and lever working in two trunions mounted on the spindle. Also mounted on the cross-shaft is a double cam which operates a bellcrank. The bellcrank transmits motion to a vertical shaft which provides an oscillating movement to the fixture carrying the work. In addition to the oscillating movement, the fixture has an indexing motion which operates according to the number of splines being honed. The maximum diameter of the gear or part to be honed is 9 in., if the part has holes in the web through which clamping may be effected. The maximum diameter with external clamping is about 7 in. The stroke may be adjusted up to 1½, while the maximum height of the job above the jig level is 5 in.



Honing Machine, Vertical, Hydraulic

W. Asquith, Ltd., Halifax, England. (Vol.78,p.496E.) F-187.

This single-spindle honing machine was developed for cylinders up to 8¾ in. diameter by



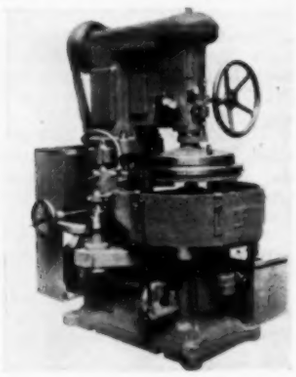
27 in. long, the stroke being 36 in. Mechanical drive with gear changes is used for the rotation of the spindle, and hydraulic drive for reciprocating the spindle. Spindle speeds range in 12 steps from 45 to 554 r.p.m. Distance from spindle to face of column, 12 in. Speed of reciprocation, 60 to 6.6 ft. per min. Table working surface, 4 ft. 3 in., by 18 in. Longitudinal traverse, 3 ft. 3 in. Floor space, 10 ft. by 6 ft. 3 in. Weight, 3 tons.

Lapping Machines

Honing Machine, Vertical, External

Burton, Griffiths & Co., Ltd., Birmingham, England. (Vol. 78,p.274E.) F-132.

A lower head is now used on the machine. The top lap or hone is driven by spiral bevels and the weight is counterbalanced. The head has a floating rack which enables the full weight of the lap or hone to rest on the work during actual time of cutting. The truing arm of the honing machine is arranged so that the diamond can be turned around and used at any angle. The machine is made by B.S.A. Tools, Ltd., Birmingham.



Lapping Machine, Vertical, Hydrolap

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.333E.) F-147.

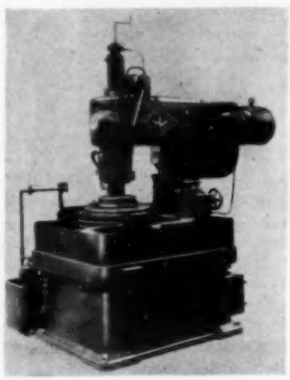
This Norton-Newall Hydrolap is built by the Newall Engineering Co., Ltd., Ponders End. The upper lap is raised and lowered hydraulically and the pressure on the work can be varied between 50 and 400 lb. per sq.in. The drive is by a 7½ hp. motor. The motor drives

by chain, two levers controlling the main drives through a ball-bearing clutch. The machine is made in two types, for cylindrical and flat surfaces. Standard capacities are 2½ in. in diameter or thickness by 5 in. long. Standard diameter of lap is 24 in.; standard face width, 5 in., and thickness, 3 in.

Lapping Machine, Vertical, Hydraulic

John Lund, Ltd., Cross Hills, near Keighley, England. (Vol. 78,p.351E.) F-154.

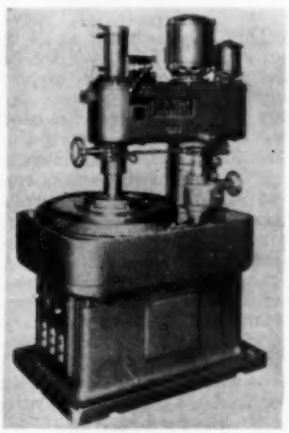
Designed for high production, combined with precision, on piston rings and similar work, this vertical machine is hydraulically operated. The arm carrying the top lap swings sideways clear of the bottom lap by means of hydraulic pressure. Laps are 24 in. in diameter and the machine will take work 2⅜ in. thick. The bottom lap speed is 104 r.p.m., and the top lap speed 100 r.p.m. Hydraulic pressure applied to the top lap is variable from 5 to 1,000 lb. total. For truing purposes clamps secure the top lap to the spindle to prevent float.



Lapping Machine, Vertical, Hydraulic

Leo C. Steinle, Ltd., Marsham St., Westminster, S.W., England. (Vol.78,p.612E.) F-225.

The two vertical lap spindles run in opposite directions. Pressure between the laps can be varied from 0 to 1,325 lb. by hydraulic means. Both cylindrical and flat parts may be lapped, and abrasive lapping wheels or cast-iron laps may be employed. Standard diameter of each lap is 2 ft. Work 2⅛x4⅛ can be taken.

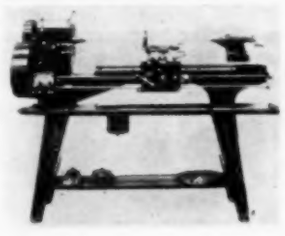


Lathes

Lathe, Engine, 6-in. Centers

C. Redman & Sons, Ltd., Halifax, England. (Vol.77, p.771E.) F-29.

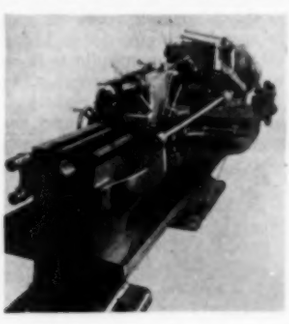
This "Cub" 6-in. center lathe swings 12 in. over the bed, 7½ in. over the saddle, and 16 in. in diameter by 4 in. wide in the gap, and admits 3 ft. between centers. The spindle is bored ⅞ in., and its six spindle speeds range from 25 to 450 r.p.m., obtained through sliding gears and dog clutch. A ¾-hp. motor drives through Texrope, direct to the headstock pulley. Three changes of feed and screw cutting are provided by the gear box. Selling agents for the British Isles are C. Churchill & Co., Ltd.



Lathe, Toolroom and Relieving

G. Swift & Sons, Ltd., Halifax, England. (Vol.78,p.192E.) F-100.

This 9 in. center universal relieving lathe is designed for general work in the toolroom and tungsten-carbide cutting tools may be employed. It admits work 3 ft. 5 in. between the centers and swings 13 in. over the saddle. The 24 spindle speeds range from 7 to 500 r.p.m., and the nine feeds from 12 to 450 cuts per in. All Whitworth and metric threads can be cut. A taper-turning motion can be used in conjunction with either sliding or screw-cutting. Relieving can be done on parallel and taper work having straight or spiral flutes, as well as end-relieving.



Lathe, Multi-Cut

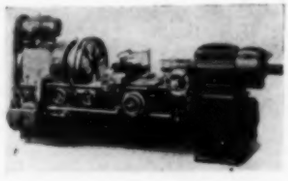
Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.193E.) F-102.

This multi-cut lathe is suitable for the use of tungsten-carbide tools. Maximum swing, 17½ in. over the bed, and 12 in. over the slides; with standard bed length the maximum distance between the spindle face and the center, 20½ in. Maximum turning length is 18 in., and the maximum facing length between centers is 8 in. Eight speeds are obtained through pick-off gears. These speeds range from 0.004 in. to 0.04 in. per rev. Both front and rear saddles obtain their feeds from this box, but independent feeds can be obtained on each slide. The feed and rapid power traverse motions are interlocked. Positive diameter stops are fitted to each slide, and the front slide has an adjustable index disk.

Lathe, Turning, Boring and Cutting-Off

A. C. Wickman, Ltd., Coventry, England. (Vol.78,p.207E.) F-107.

A. H. Schutte, Cologne, Germany, build this turning, boring and cutting-off machine to suit bars from 3½ in. to 11¾ in. in diameter, swinging 20½ in. over the bed and 15¾ in. over the tool slides, while the maximum depth bored is 19¾ in., and the maximum distance between the boring head spindle and the chuck is 47¼ in., with a bed 34½ in. wide by 10 ft. 8 in. long. The main drive is by 20-hp. motor and multiple V-belt. At the other end of the lathe the boring head carries towards the back of the machine a two-speed 10 hp. motor which, with triple gearing, gives six boring speeds, the range being from 40 to 300 r.p.m. The 36 reversible feeds from 0.09 to 2.5 mm. per rev. can be given with the boring head spindle not rotating, and these feeds may be further subdivided if the spindle rotates. At the front the spindle carries a six-jaw chuck. Longitudinal travel of the front slide is 25½ in., and of the rear slide, 17¾ in.



Lathe, Engine, 15-in. Centers

C. Redman & Sons, Ltd., Halifax, England. (Vol.78, p.226E.) F-114.

This lathe admits work 7 ft. long between centers and swings 30 in. over the bed, 23½ in. over the saddle, and 52 in. in diameter by 16 in. wide in the gap. The flanged spindle has a 5½ in. hole right through.

The 18 spindle speeds, forward and reverse, range from 8 to 256 r.p.m. Lubrication of the head is by splash and forced-feed. Some 40 changes are provided, giving a range of standard threads, fine and coarse feeds, and index plates are fitted. Floor space, 17 ft. 3 in. by 5 ft. 3 in. Power required, 20 hp.

Lathe, 6-in. Centers

Craven Brothers (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.259E.) F-129.

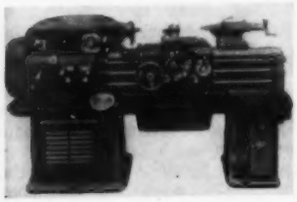
The firm's standard repetition lathe is shown tooled-up to turn simultaneously the four bearings of automobile camshafts. The drive to the headstock provides six changes of speeds from 195 to 830 r.p.m. Three feeds are 64, 86, 112 cuts per in. enabling either alloy or super high-speed steel tools to be used. The main and following saddles are mounted on the front V-way and its adjacent flat way. The two saddles are connected together by an adjustable turnbuckle, allowing an adjustment of 2 in. in their relative positions. Thus, the machine can deal with camshafts of varying lengths and bearing positions.

The longitudinal feed to the saddles is by hand and power, while the in-feed, independent on each saddle, is by hand only.

Lathe, Engine

G. Karger A.G., Berlin, Germany. (Vol.78,p.318E.) F-143.

This precision lathe for using tungsten-carbide or diamond-tipped tools has a main spindle speed of 1,200 r.p.m. The center heights built are 4¾, 6¾ and 8 in. Between centers the small lathe will take 20 in., the intermediate size, 23⅝ in. or 39⅜ in., while the largest will take 27½ in., or 59 in. The 6 spindle

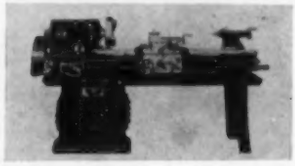


speeds are 1,200 to 208 r.p.m. By means of a backshaft the speeds are doubled, giving a lower range from 150 to 26 r.p.m. The spindle is relieved of belt tension and vibration is minimized. It runs in two adjustable plain bronze bearings. The upper slide on the cross-slide has an eccentric movement for quick withdrawal of the tool and rapid return for screw-cutting.

Lathe, Engine, 7-In. Centers

B. Elliott & Co., Ltd., Tileyard Road, London, N., England. (Vol.78,p.377E.) F-161.

In this machine the motor is mounted at the bottom of the cabinet leg and the base is pivoted. The pulley drives by Texrope to a clutch shaft above on an intermediate gearbox, which provides four speeds through sliding gears. From this box the speeds are transmitted to the head stock spindle by a flat felt with adjustable idler pulley. The spindle, bored 1⅜ in., is mounted in plain adjustable bearings. The

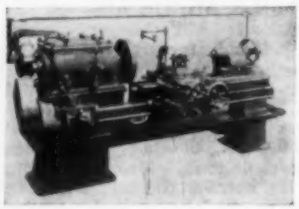


speeds obtained range from 30 to 750 r.p.m. The gap allows a swing up to 21 in. in diameter and a gap piece is available. Normal swing over the bed is 13½ in. and over the cross-slide, 8½ in. The Norton type feed-box gives 27 changes from 0.0008 in. to 0.03 in. per rev. of the spindle for sliding, and from 0.0004 in. to 0.01 in. for surfacing. Five bed lengths are built to provide center distances of 20 to 80 in.

Lathe, Engine, All-Geared

Stanley Machine Tool Co., Ltd., Halifax, England. (Vol. 78,p.417E.) F-165.

All-geared lathes are being built in sizes from 8½ to 12½ in. centers. The 8½-in. machine shown admits 3 ft. 9 in. between centers and swings 32 in. diameter in the gap. Twelve spin-

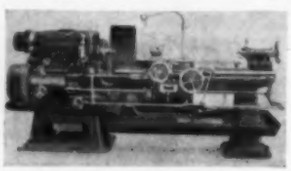


dle speeds range from 11 to 205 r.p.m. The compound slide-rest sets over for taper turning and the apron is double-walled. The sliding, surfacing and thread-cutting motions are fully interlocked. The feedbox gives 32 feed changes to both leadscrew and feedshaft.

Lathe, Engine, 6½-In Centers

Dean, Smith & Grace, Ltd., Keighley, England. (Vol.78, p.608E.) F-219.

This lathe swings 13¾ in. over the bed, 9¾ in. over the saddle, and 23½ in. in diameter by 7½ in. wide in the gap. With an 8-ft. bed it admits 4 ft. 2¾ in. between centers. The 18 spindle speeds range from 14.9 to 480

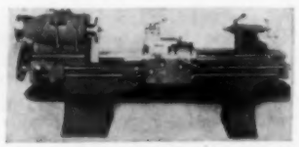


r.p.m. The spindle is bored 2 in. and in addition to the threaded nose has a large flange for chucks. Other features include a quick-pitch screw cutting or coarse feed arrangement which increases in the ratio of 8 to 1, but can be used only with the low range of spindle speeds. The standard feeds in eight steps range from 184 to 6 cuts per in.

Lathe, Engine, 8½-In. Centers

Colchester Lathe Co., Hythe, Colchester, England. (Vol.78, p.614E.) F-229.

This improved "Mascot" lathe has been made stiffer and stronger than formerly. The headstock has larger bearings and heavier shafts, and all sliding gears and the clutch on the spindle are multi-splined. The spindle nose has a larger ground surface for the faceplate and chucks. A single driving pulley running on ball bearings with



friction clutch is now fitted. Three bed lengths are available. The largest, 12 ft. long, takes 8 ft. 6 in. between centers, and swings 12 in. over the saddle. In the all-gear head the clutch and sliding gears give eight speeds in geometrical progression from 15 to 255 r.p.m. A quick-change gearbox provides 24 thread pitches from 3½ to 48 per in., and 24 feeds from 10 to 144 cuts per in.

Lathe, Engine, Toolroom-Type

Holbrook Machine Tool Co., Ltd., Stratford, E., England. (Vol.78,p.633E.) F-244.

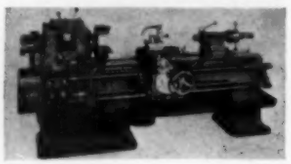
This lathe is rated at 21 in., but swings 22½ in. over the bed and 13 in. over the carriage and takes 48 in. between centers. The all-gear headstock provides 16 speeds ranging from 8 to 408 r.p.m. Driving clutches are of the multiple-disk type, and all shafts rotate in roller bearings. A quick-change gearbox provides the sliding and surfacing feeds and also 60 pitches from 1 to 56 threads per in. The carriage is designed to receive the internal slide which is controlled by the taper turning attachment. The top slide will swivel 360 deg. Power required, 7½ hp. Floor space, 11 ft. 2 in. by 4 ft. 4 in.

Feeds are operated by finger-tip controls, one for sliding and one for surfacing, with hand traverse by handwheel through rack and pinion. Roller bearings are fitted where necessary, and the cross-slide and top rest screws have ball thrust bearings. A threading dial and distance traveling dial are fitted. Automatic stops for the longitudinal feed can be set on each side of the apron.

Lathe, Engine, General-Purpose

G. Swift & Sons, Ltd., Halifax, England. (Vol.78,p.660E.)

This 8½ in. center by 8 ft. bed lathe admits 4 ft. between the centers with a swing of 1 ft. over the saddle. Tungsten-carbide tools can be used. The all-geared headstock gives 12 spindle speeds, ranging from 13.6 to 500 r.p.m. The spindle is bored 2½ in. Reversing motion for cutting left- and right-hand threads or for sliding and surfacing in either direction is self-

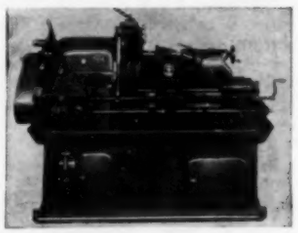


contained and controlled by a lever on the headstock front. The screw-cutting and feed gearbox gives a range of nine feeds from 12 to 450 cuts per in., and in conjunction with change wheels, 56 Whitworth threads from 1 to 80 threads per in., and 8 metric threads can be cut.

Lathe, Semi-Automatic

Hille Werke A. G., Dresden-Reick, Germany. (Vol.78,p. 156E.) F-92.

In this semi-automatic lathe for machining cocks, the motor has two speeds, 750 r.p.m., and 1,500 r.p.m. Three roughing speeds are 480, 600 and 750 r.p.m., and the three finishing speeds 960, 1,200 and 1,500 r.p.m. Six feeds range between 0.05 and 0.192 mm. for finish-



ing and three feeds, from 0.130 to 0.320 mm. for roughing. By means of an attachment when the roughing tool at the front of the machine has completed its work, its feed is cut off and a templet guide is switched over and the second tool comes into operation. Simultaneously, the motor is switched to the higher speed range, and the feed automatically changes to the finer range. For the bores a single bar is used with two tool inserts, one of cemented carbide and the other a diamond.

Lathe, Semi-Automatic, Multi-Cut

J. Lang & Sons, Ltd., Johnstone, near Glasgow, Scotland. (Vol.78,p.629E.) F-237.

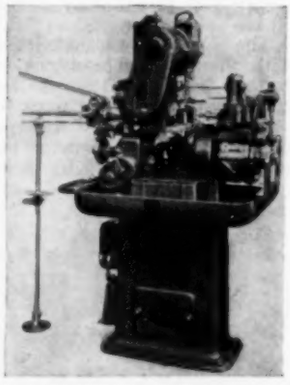
The Lang-Heinemann multi-cut lathe is of 8½ in. centers and will swing 16½ in. over the front saddle, 13½ in. over the front and back slides, and 13 in. over the universal back saddle when fitted. The maximum distance between centers of the machine with a bed 9 ft. 9 in. long is 5 ft. Four bed lengths are made, ranging from 7 ft. to 11 ft. 3 in. The feed is effected by a rack. The machine also has a back carriage intended primarily for surfacing. Sliding gears provide eight spindle speeds from 26 to 312 r.p.m. Hollow spindle is bored

2¾ in. Toolholders are interchangeable on the front and back carriages. For automatic feeds the spindle drives by spur gearing to the feedbox, the latter giving six changes through sliding gears and a tooth clutch controlled by two levers. The feedbox is connected to the feed racks on the carriages by worm gearing and two pairs of change gears. With six change wheels, the 32 feeds are available on each slide, the range being from 8 to 504 cuts per in. On each slide the feeds can be disengaged automatically. For quantity production a quick withdrawal of the two carriages can be set in motion automatically. Drive is by 25-hp. motor.

Lathe, Automatic, Four-Operation

Brown & Ward, Ltd., Tyburn, Birmingham, England. (Vol.78,p.194E.) F-103.

This machine with a capacity of ⅝ in. by 1¼ in. will turn, form, knurl, face and cut-off by the cross-slide, and drill or turn from the turret slide. Speeds range to 6,000 r.p.m.



Bar-feeding mechanism is weight-operated and the feed tube swivels, so the bars can be inserted from the front end. Cams bolted to separate disks keyed to the main camshaft operate the cut-off and forming slides, a series of tapped holes in the disks providing fine adjustment for the cams. Cams bolted to a drum operate the turret slide. Pick-off gears give outputs from 1¼ to 36 pieces per min.

Lathe, Automatic, Single-Spindle

A. Butterworth & Co., Rochdale, England. (Vol.78,p.303E.)

This large automatic can be used as a 3½ in. bar machine or as a chucking machine, the spindle then being equipped with a 12 in. chuck. The travel of the turret may be 9½ or 8 in., and travel of the cross-slides, 4½ in. The machine swings 9¾ in. over the cross-slides. The minimum distance between the chuck face and the

turret is 9¾ in., and the maximum distance 15⅜ in. Some 78 reversible speeds can be obtained, from 20 to 615 r.p.m. The forward and reverse motion of the spindle at any speed enables threading, both internal and external, right- or left-hand, to be done. On the top of the headstock, in alignment with the spindle, is a machined seat on which can be secured an overhead magazine, an independent cross-slide, a high-speed drilling attachment drive, or a pilot attachment.

Lathe, Automatic, Six-Spindle, Schutte

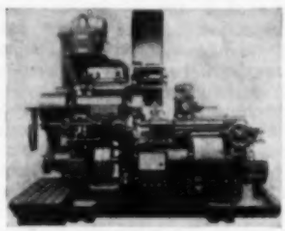
A. C. Wickman, Ltd., Coventry, England. (Vol.78,p.611E.) F-224.

The Schutte six-spindle bar automatic is designed for the production of parts requiring relatively short machining times, frequent indexing of the spindle cylinder, and short idle times. The operations of turning, drilling and boring, etc., are subdivided among the work spindles so that the spindle cylinder is indexed after each cycle of operations and the work is machined in stages until the final position. The power is transmitted from the feed box to a central shaft which drives the work spindles in the headstock, the various work spindle speeds being obtained by change gears, The camshaft controlling the feed of the tools is driven through a gearbox from the main shaft. The indexing time is constant and independent of the work-spindle speed. Main and cross-slides are cam-operated from a variable-speed camshaft. The main tool slide has six holes for tools and is also fitted with a swiveling tool block having five clamping surfaces so that, including the tools on the four cross-slides, 15 tools may be used simultaneously. By using double-deck tools this number may be further increased. Each of the cross-slides is operated by a separate cam and lever system. The chucking arrangement is of the draw type. The machine will take up to 1⅞ in. bar and cut threads up to ⅝ in. diameter. Maximum tool-slide travel is aproximately 5½ in., and the bar feed 6¼ in. Hourly production of the machine varies from 19 to 625 pieces.

Lathe, Automatic, No. 3A

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.632E.)

The No. 3-A Auto-Lathe is offered for machining medium-size parts. Diameters up to 9 in. may be machined when not exceeding 2 in. in thickness, while 6 in. diameter can be machined for lengths up to 5 in. The speed range renders the machine suitable for work made from non-ferrous materials as well as from cast iron or steel. The turret slide is actuated by



cams on a drum. Cross-slides are independent and can be operated either simultaneously or at different points of the cycle. They are actuated by forward and return cams on two adjacent disks which may be adjusted around the camshaft. There are two ranges of feed, fine and coarse, each of five feeds, obtained automatically through a sliding shaft with rising and falling key. The feed changes are selected by the position of a pin which screws into a series of tapped holes in the drum. Two series of adjustable dogs make the change from the idle motion to the feeding motion. An air-operated chuck is fitted. Maximum swing, 9 in.; maximum swing over cross-slides, using full stroke, 5½ in.; maximum and minimum distances from flange to spindle to face of turret, 21½ in., and 11¾ in., respectively; working stroke of turret, 6¼ in.; maximum and minimum stroke of cross-slides, 3¼ in. and ½ in.

Lathe, Automatic, ⅝-In.

A. C. Wickman, Ltd., Coventry, England. (Vol.78,p.656E.) F-264.

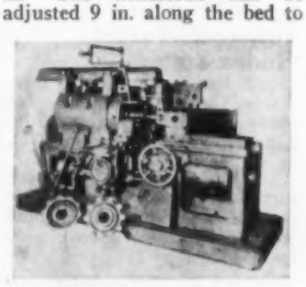
The ⅝-in. automatic is intended for production of relatively plain parts from bar material, but can be used as an automatic cutting-off machine. Maximum cutting travel of all slides is 2 in.; length of stock

feed, 3 in. The time-cycle of the fast motion is 1 sec., and of the feed motion, 1 sec. to 2 min. Four ranges of spindle speeds are available, each of four speeds. The maximum standard range is from 4,200 to 687 r.p.m., and the minimum range from 1,450 to 465 r.p.m. A separate motor for the feed mechanism drives through a sleeve and dogs. The main tool-slides and cross-slides are independent and are operated by disk cams through levers at the right-hand end of the machine. The bar feed and chucking mechanism are at the left-hand end of the spindle and are operated by disk cams. If required, a special picking-up attachment can be fitted, for use when finishing-off small pins and rollers, thus saving a second chucking operation.

Chucking Machine, Automatic, Single-Spindle, No. 4

Butterworth & Co., Rochdale, England. (Vol.78,p.636E.)

Said to be the largest chucking automatic made in Great Britain, this machine swings 26 in. over the bed and 16½ in. over the cross-slide. The turning limit with standard turret tools is 18½ in., and the travel of the cross-slide is 6 in. each way, and of the turret slide 14 in. The headstock can be adjusted 9 in. along the bed to

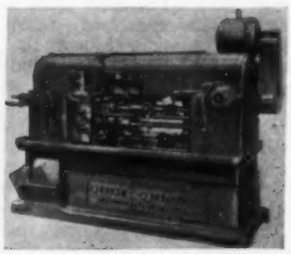


suit the length of the work. Speeds range from 13 to 256 r.p.m. in 19 groups each of three. The feeds range from 0.005 to 0.118 in. per rev., divided into five groups each of five. The maximum distance from the turret face to the chuck is 18¾ in. or 22¾ in. to the spindle flange. In addition to general chucking work, the automatic is said to be suitable for machining high-strength, heat-treated steels, using tungsten-carbide cutting tools.

Chucking Machine, Multiple-Spindle, "Conomatics"

C. Churchill & Co., Ltd., Walnut Tree Walk, London, S.E., England. (Vol.78,p.639E.)

Both the 1½- and 2-in. "Conomatics" have a lower bed of box construction, with a top bed carrying cam drums and cams for all tool movements, stock feed and chuck operation, and control of high and low



speed movements. Chips fall into a well in the base. The spindle carrier unit is at the left-hand end of the machine, and all spindles run in taper roller bearings. The collet and collet tubes may be removed complete from the end of the spindle for quick changing. The front of the spindle carrier supports four independent cross-slides which are mounted vertically to reduce overhang. The main slide permits the use of a variety of tooling combinations. An auxiliary slide is available for end operations in the two upper positions, while a supplementary tool-head is bolted to the under side of the top bed to carry a sliding spindle. Threading operations can be carried out at any station, and two such operations can be effected simultaneously on the two upper stations. Maximum length of feed is 10 in.; maximum length turned, 7 in.

Screw Machine, Automatic-Turret, "Index 36"

Leo C. Steinle, Ltd., Marsham St., Westminster, S.W., England. (Vol.78,p.631E.)

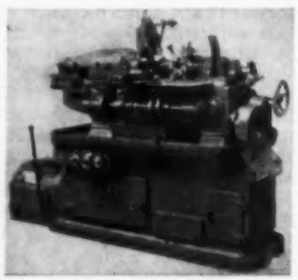
In the Index 36 automatic turret screw machine, the automatic change of spindle speeds enables 4 cutting speeds to be employed for different diameters on the same part. The upper portion of the machine accommodates the main spindle, tool heads and the camshafts. Main drive can be by pulley or direct-connected flange motor.

Four automatic speed changes to each pair of speed gears are available for the one piece, one fast and one slow speed left-hand for turning, and one fast and one slow speed right-hand for threading and reaming. Through the medium of 8 change gears and the gearbox, 36 spindle speeds are available. Two ratios of threading speeds, 1 to 2 and 1 to 5, are available to each turning speed. The turret has six holes. Chuck capacity is 1 1/32 in. round, 1 7/8 in. hexagon, and 1 in. square. Maximum bar feed is 3 9/16 in., and the diameter of thread for soft steel 1 3/8 in., and for brass 1 3/8 in. The main spindle has 16 speeds from 120 to 1,500 r.p.m. for turning, and from 60 to 750 r.p.m. for threading in both directions.

Screw Machines, Automatic

B.S.A. Tools, Ltd., Birmingham, England. (Vol.78,p.613E.)

These two screw automatics are of 1 and 1 1/4 in. capacity, respectively. The larger machine has a maximum feeding length of 4 in., and parts up to 3 in. long can be turned. The machine will work on square or hexagonal sections. The model described has 14 left-hand speeds from 180 to 1,790 r.p.m., and 14 right-hand speeds from 90 to 895 r.p.m. The camshaft controls the stock feed, cross-slides, spindle speed change and reversal and the turret cam drive, and is operated from the back shaft through a worm

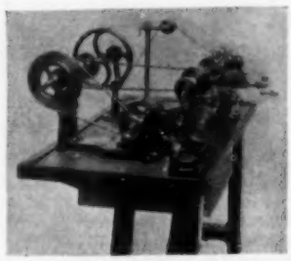


drive and pick-off gears, providing 49 cycle times from 6 to 480 sec. per one revolution of the cam, independent of the spindle speed. Dog clutches are mounted on the back shaft and control the movement of the work spindle and apron clutches, stock-feed, collet opening and closing cams and turret indexing mechanism. The collets are operated by toggles and are adjustable for variation in stock size. The vertical type turret is 5 1/2 in. in diameter with 1-in. holes, and has six tool stations. Maximum tool projection is 3 1/4 in. The distance between the turret and chuck is 2 1/4 in. minimum to 6 1/4 in. maximum. Provision is made for fitting a third, or vertical, cross-slide if required. The 1-in. machine may be furnished with either short or long stroke for feeding parts either 2 1/2 in. or 4 in. long.

Lathe, Screw-Cutting Precision

Stedall - Dowding Machine Tool Co., Ltd., St. John St., Clerkenwell, E.C., England. (Vol.78,p.638E.) F-252.

This Lorch precision screw-cutting lathe has a 2 1/2 in. height of centers. The motor drives a countershaft at the rear which

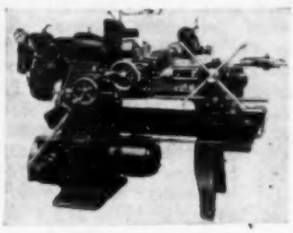


has small and large pulleys. The large pulley may be employed for driving the grinding attachment when used. The bed admits 12 1/2 in. between centers and provides separate V-guides for the saddle and tailstock. The spindle is bored through 2 3/4 in. to take a drawbar for closing the split chuck. Automatic feeds are transmitted through change gears on the left-hand side of the headstock. The cross-slide carries a swivelling top-slide which provides sufficient movement for comparatively long taper cuts. Accessories available include a capstan slide for four tools with automatic reversing lever.

Lathe, Turret, High-Speed

Alfred Herbert, Ltd., Coventry, England. (Vol.77,p.700E.)

The improved No. 2S turret lathe has a four-change feed box which the firm calls a "Duo-Rate" cross slide. The machine is of 5 1/2 in. height of centers, taking a 1 1/4 in. bar through the draw-in chuck, or 1 1/8 in. with the chuck removed. Swing over the cross-slide is

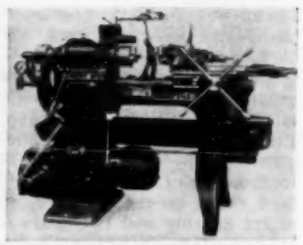


5 1/2 in. in diameter. With the standard bed the maximum distance from the spindle flange to the capstan is 18 3/4 in., while the working stroke is 5 1/2 in. Speeds from 46 to 3,090 r.p.m. are available in three ranges. The speeds are low enough for cutting 3/4 in. threads in chrome-nickel steel and high enough for the newest cutting materials on small chuck work. Maximum distance between the toolposts is 9 in. Four feeds range from 80 to 960 cuts per in.

Lathe, Turret, No. 2S, Special

Alfred Herbert, Ltd., Coventry, England. (Vol.77,p.740E.)

Machine has been modified for producing fusible plugs employed in boilers. Output capacity is indicated by the fact that fusible plugs made from brass cast-



ings and 1 1/4 in. in diameter by 1 1/8 in. long on the threaded part may be completed at the rate of 80 per hr. The difference from the No. 2S capstan lathe is in being provided with hand feed only to the capstan slide, while the cross-slide is omitted and a special chasing arrangement and the firm's 6-in. air chuck are provided. Apart from chasing, all the machining operations are carried out by the capstan, the taper being turned by a special device, the body of which is adjustable to suit various cones. The lathe is of 5 1/2 in. height of centers.

Lathe, Turret, No. 3A

H. W. Ward & Co., Ltd., Birmingham, England. (Vol.77, p.754E.) F-24.

The No. 3A capstan lathe, with single-pulley headstock or motor drive, is suitable for chuck work or for bar work up to 1 1/4 in. in diameter. It is of 6 1/4 in. height of centers, the length of bed being 5 ft. 1 1/2 in.

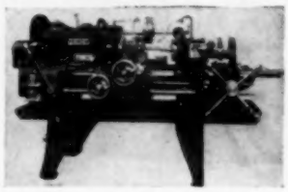
The automatic chuck is self-contained. Six spindle speeds, both forward and reverse are available. Along the bed the total adjustment of the sliding saddle and cross-slide is 13 in., the swing over the cross-slide being 9 in., and the maximum distance between the tool posts, 13 1/4 in. A distance of 20 in. can be admitted between the front of the chuck and the capstan, and with automatic revolution the maximum useful stroke of the capstan is 8 in., or with the capstan revolved by hand, 11 in. A cam-operated automatic brake brings the spindle to rest when the clutch lever is moved to the center position. Two toolposts are fitted as standard.

Lathe, Turret, Multi-Tool

Benrath Machine Tools, Ltd., John Dalton St., Manchester, England. (Vol.78,p.84E.) F-63.

Multi-tool holders are mounted on the turret and supported at

the extreme front by a block carried on a projecting guide of the turret slide to obtain rigidity. Accessibility is improved and the tools are arranged horizontally in their holders for easy setting. Holes in the corners of the turret take bar stops which rotate with the capstan and automatically trip the feed. Micrometer dials are provided for all motions of the slides. Special dials for the saddle and capstan slide enable work to be machined within 0.0004 in. Ten forward speeds are provided by the headstock. On the saddle a swiveling tool-

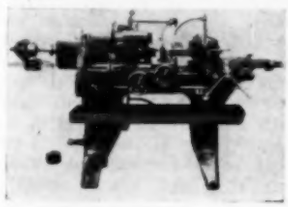


block may carry plain toolholders to obtain a variety of cutter combinations both for roughing and finishing operations. The saddle can be moved beyond the chuck to enable the turret to be brought close-up for machining short work. Eight automatic feeds in both directions are provided to the turret-slide, saddle and cross-slide. Capacity of the automatic bar chuck is 1 3/32 in., the bore of the spindle being 2 1/16 in. Height of centers 6 1/2 in.; swing over cross-slide 11 1/4 in.; distance between chuck and turret face, 26 in., power required, 5 to 8 hp.; weight, 2,975 lb.

Lathe, Turret, Multiple-Tool

Benrath Machine Tools, Ltd., John Dalton St., Manchester, England. (Vol.78,p.101E.) F-72.

Built by Gebr. Heinemann A.G., St. Georgen, Germany, this multi-tool capstan lathe is equipped with multi-tool holders in the turret, and they are supported at the extreme front end by a bracket attached to the rear side of the bed, replacing the overhead steady bar system. The saddle and capstan slide operate automatically and simultaneously. The headstock provides eight forward speeds. Four feeds are available. The saddle provides four cross and longitudinal automatic feeds. The top slide has two parts which may be connected for the rear and front tool holders to work in unison, or the rear part may be clamped while the front part operates. For copying or

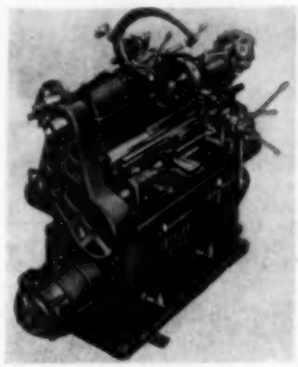


forming work the former and sliding toolholder are carried at the front of the slide, while at the rear is located a follow rest. The hexagon turret has automatic indexing and locking arrangements. The slide has four automatic feeds. Capacity of the automatic chuck is 1 5/16 in. in diameter; hole in spindle, 1 1/16 in. in diameter; height of centers, 6 1/2 in.; swing over cross-slide, 6 7/8 in.; diameter of turret holes, 1 1/4 in.; maximum distance from chuck to turret face, 24 1/2 in.; power required, 2 to 6 hp.; weight, 1,890 lb.

Lathe, Turret, High-Speed

Dowding & Doll, Ltd., Westminster, S.W., England. (Vol. 78,p.255E.) F-124.

Built by Pittler Werkzeugmaschinenfabrik A. G., Leipzig-Wahren, this lathe is used for manufacture of brass or soft metal parts from the rod or from tubing up to 1 1/8 in. in diameter. Cast or malleable parts in small sizes can be machined in the chuck. Four



spindle speeds are available in each direction and two speeds are obtainable through a multiplate clutch. The four speeds of each of the two speed zones lie between 950 and 2,650 r.p.m., and between 236 and 6,670 r.p.m. The distance between the twelve tool holes in the head and the spindle bore has been increased to correspond with increased working capacity.

Lathe, Turret, No. 2B

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.454E.)

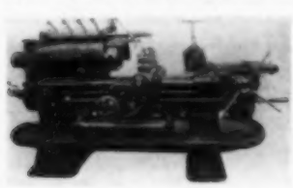
The No. 2B is of similar capacity to the No. 2S turret lathe and may be driven by a self-contained motor or by belt. It is intended for small and

medium-size work, and various chucking arrangements are available, including the 6-in. concentric chuck, the 6-in. air-operated chuck, a draw-in chuck for bars up to 1 1/4 in., and toggle chuck for normal bar work up to the same size, or for light bar work up to 1 1/8 in. Six spindle speeds range from 200 to 2,000 r.p.m. as standard. Height of centers, 5 1/4 in.; swing over the cross-slide, 5 3/4 in.; maximum distance from the spindle flange to the capstan, 18 3/4 in.; working stroke of capstan, 5 1/2 in.; automatic feeds, 80 to 160 cuts per in. A square turret can be supplied. Two open-side toolposts are furnished, the front post having longitudinal adjustment and the back post transverse adjustment on the slide.

Lathe, Turret, No. 7

H. W. Ward & Co. Ltd., Birmingham, England. (Vol.78, p.642E.) F-259.

This No. 7 capstan lathe uses tungsten-carbide cutting tools to maximum capacity. It is of 8 3/4 in. centers, swinging 9 1/2 in. over the steel cross-slide. Length of the automatic feed to the saddles is 19 in. The spindle has a 2 1/4 in. hole and is carried in roller and ball thrust bearings. Eight spindle speeds are



available in any one of three ranges. The saddle has automatic sliding, surfacing, and screw-cutting motions. The cross-slide carries a square turret giving four tool positions on the front and one tool-post on the rear. The five reversible feeds give 26 to 104 cuts per in. The ten feeds provided for the capstan slide vary from 13 to 270 cuts per in. of traverse. Normal stroke of the top slide, when using the automatic revolving motions, is 8 in., but if the turret is revolved by hand a useful stroke of 11 in. is available.

Lathe, Turret, No. 12

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.615E.)

The spindle runs in roller and double ball bearings. An overhead support bar steadies the turret tools. Starting and stopping can be effected from the headstock, the saddle, or the turret slide. The chasing saddle apron carries the mechanism for the reversible automatic longitudinal and transverse feeds.

The cross-slide carries a square turret at the front and a toolpost at the rear. The hexagonal turret is of extra height so that adequate support is provided for knee-type and other tools, and the turret can be rotated by hand in either direction. Quick power traverse along the bed is provided for both saddle and turret slide. Maximum swing over bed covers is 23 1/4 in.; maximum swing over cross-slide, 15 1/2 in.; diameter of hole through spindle, 6 1/4 in.; maximum distance from flange of spindle to face of turret, 75 in.; size of each face of turret, 10 1/4 in. wide by 11 in. high; diameter of tool holes, 4 1/16 in. The 16 forward spindle speeds range from 15 to 598 r.p.m. and the 8 reverse speeds from 15 to 474 r.p.m. The 16 chasing saddle and turret slide feeds are from 6.2 cuts to 241 cuts per in. longitudinal and from 10.4 cuts to 408 cuts per in. transverse.

Lathe, Cart-Axle

Ward, Haggas & Smith, Keighley, England. (Vol.77,p. 698E.) F-9.

This 7 1/2-in. center duplex lathe is designed for machining the ends of axles used on ordinary carts. Each end has a straight part and is then tapered and again straight. The left-hand headstock is adjustable along the bed. Each cast iron

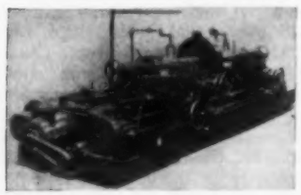
spindle has a 4-in. hole right through. Drive is taken to each spindle from a shaft running the full length of the bed, from fast and loose pulleys. Spindle speeds are 58 and 88 r.p.m. The saddle is arranged with one rate of feed only, 60 cuts per in. Four-tool turrets, having hand adjustment across the bed, are fitted. The turrets are carried on former slides supported at the rear.

Lathe, Axle-Shaft, Center-Drive

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.497E.) F-189.

This 10 1/4-in. center, centrally driven, multi-tool, axle-shaft lathe is specially tooled for turning completely from the bar, the full range of tramway axles, dynamo and motor and

other transmission shafts, using high-speed steel tools and tungsten-carbide tools. It is semi-automatic in operation, having adjustable sizing and length trips and also adjustable stops for use when returning the saddle to the predetermined starting position. Lathes are made in sizes from 6 to 20 in. height of centers. Each tool is carried in a block of definite size, so that the range of tools can be set by pin or block gages



inserted between the tool blocks. The front tools are used for sliding operations, taper turning gear being provided, and all forming and shouldering is done by tools on the rear slide. The machine shown will admit 6 ft. 6 in. between the loose headstocks. Drive is by 15-hp. motor. The spindle is bored 11 in., and the six speeds range from 10 to 76 r.p.m.

Lathe, Axle-Finishing Double-Ended

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.78,p.639E.)

The two ends of a railway axle are machined simultaneously on this double-ended lathe. The machine will take axles 9 ft. long overall by 10 in. maximum diameter and has a central driving head with two tailstocks. One of these at the right hand end can be moved

across the bed to permit an axle to be threaded through the driving head. The height of centers is 15½ in., and the hole through the spindle is 13 in. Each saddle has a long cross-slide which acts as front and rear slides. On the front slides are carried the tools for longitudinal traverse, while the back slides carry tools for forming or incutting. Adjustable automatic knock-offs stop the in-cutting action at pre-arranged points. The finishing tools are of tungsten carbide.

Lathe, Wheel, Boring and Center Turning

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.89E.) F-68.

This machine will bore tires from 1 ft. 10 in. to 4 ft. 1 in. in the bore and turn, bore and

boss wheel centers between the same sizes. The lathe consists of two similar units in line with the beds bolted together. Each unit has a headstock of 3 ft. 3 in. height of center and contains gearing which is totally inclosed and driven by a constant-speed, 20-hp. motor. The sixteen spindle speeds range from 1 to 70 r.p.m. Four feeds are from 12 to 48 cuts per in. The saddles have both hand and power longitudinal and transverse feeds, the left-hand tool slide being arranged as a four-station turret while the right-hand slide has T-slots for tool bars. Each rest has independent variable and reversible feeds. Weight, 36 tons.

Lathe, Wheel

Selson Machine Tool Co., Ltd., Abbey House, Victoria St., S.W., England. (Vol.78,p.103E.) F-73.

Lathe will admit wheels up to 3 ft. 6 in. in diameter, taking 6 ft. between the faceplates. In both heads the spindle is bored out and fitted with a loose barrel carrying a collet adjusted by a star wheel at the end.

Each faceplate is bolted to a large flange on the spindle and has four serrated drivers. The loose head is adjustable along the bed by power. The tool slides are of square design, and the middle slides are arranged to swivel to obtain the angle required for the wheel threads. Positive, self-acting cross and longitudinal feeds are provided.

Lathe, Wheel

W. Asquith, Ltd., Halifax, England. (Vol.78,p.243E.)

This carriage and wagon wheel lathe admits wheels up to 4 ft. diameter, the maximum length of axles that can be passed through being 9 ft. 6 in., and the gage admitted being 5 ft. 6 in. maximum, and one metre minimum. Spindle rams are bored taper at the front to suit the split journal collet and are spring loaded to provide

automatic centering of the wheel set. The four drivers built into each faceplate are of the automatic, radial-acting cumulative grip type, to grip the inside of the tires. The headstock drive is by 50-hp. motor. Four rates of reversible feeds are 0.10 to 0.3 in. per rev. for the top slides across the tire tread and to the bottom slides for side facing.

Lathe, Wheel, Heavy-Duty

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.468E.) F-178.

This heavy-duty wheel-lathe is designed for returning simultaneously the profiles of a pair of tramway wheels of 1 ft. 9¾ in., or 2 ft. 7¾ in. diameter, that have been surface-hardened in running. The machine will admit axles up to 6 ft. 6 in. long, the gage of the wheels being 4 ft. 8½ in. The firm guarantees to return a pair of surface-hardened driving wheels

in the larger size in floor-to-floor time of 25 min. Both headstocks traverse along the bed, and are clamped pneumatically. Two pneumatically operated three-position turret rests are provided. An electric wheel lift enables the wheel to be raised into position for turning. The speeds of the faceplates are 2 and 3 r.p.m. at 50 hp., and half these rates at 25 hp. The turrets each accommodate two roughing tools, for tread-turning and flange-topping, together with a flange-forming tool, while the third position can be occupied when required by a combined flange-and-tread profile-forming tool.

Lathe, Wheel, 5-Ft.

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.605E.) F-215.

This machine is intended for turning new or returning worn carriage and wagon wheels from 2 ft. 9 in. to 3 ft. 9 in. diameter on the tread by 5 ft. gage, the maximum length of axles being 9 ft. 2¾ in. The machine is of the roll-through type, and thus both headstocks with the tool slide move along the bed. All tools for each tire are permanently fixed on the appropriate slide, so that roughing, forming and finishing operations are completed without replacing a tool. An electric hoist

lifts the wheel set into the machine. Automatic feed of the slides is by ratchet, giving four rates, namely, 1/16, 1/8, 1/4 and 1/2 in. per rev. With the gear changes, the 20- or 40-hp. motor gives six speeds, from 0.7 to 2.2 r.p.m.

Lathe, Wheel, 42-In.

Ward, Haggas & Smith, Keighley, England. (Vol.78,p.364E.) F-157.

Both standard and meter gage wheels up to 42 in. in diameter can be machined. Lathe admits 9 ft. between the faceplates, which are each 4 ft. 5 in.

in diameter. The main driving motor is 30 hp. Tool slides are of square design and the middle slide swivels to suit the wheel treads.

Wheel-Loading Device, Axle-Lathe

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.78,p.242E.)

A device has been arranged on an axle-journal returning and burnishing lathe so that the wheel sets can be raised mechanically to the center height for treatment in the machine. A shaft at the rear is employed through reduction

gears to drive two endless chains, the shaft itself being driven by the main motor. One chain is provided at each side of a small carriage on the runway for use when varying diameters have to be met. Fine hand adjustment is provided for setting the axles to the correct center height.

Lathe, Brake-Drum

E. G. Jones (Machine Tools), Ltd., Baldwin Terrace, London, N., England. (Vol.78,p.256E.) F-125.

Built by Geb. Boehringer G.m.b.H., Goeppingen, Germany, this special lathe for turning and finishing internal face of brake drums employs tools of high-speed steel and tungsten-carbide. It will deal with work from 7⅞ to 19¾ in. in diameter, by 5¾ in. wide. Two tools, rough-turning and finishing, are used simultaneously. They are set diametrically op-

posite one another. When the job is completed the machine is tripped automatically. Thus one man can operate several machines.

Lathe, Drill-Shank Turning

Herbert Hunt & Sons, Old Trafford, Manchester, England. (Vol.78,p.89E.) F-205A.

This special lathe for turning shanks and bodies of drills, reamers and other small tools is intended for use with cemented-carbide or alloy tools

cutting at high speeds. The bed receives fast and loose headstocks, as well as ways for a sliding saddle at the front and a cross-slide at the rear. The saddle can be adjusted for parallel or taper turning, while the cross-slide is arranged for carrying multiple tools for "ending-up" and recessing.

Lathe Headstock, "Preoptive"

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.22E.)

To effect a saving in idle time, the company has designed a "Preoptive" lathe headstock which enables the operator to select any speed within the range available in advance and while cutting takes place, and when the selected speed is required all that it is necessary is the movement of a lever to effect the change immediately with the machine still under cut. Whatever the form of drive, eight spindle speeds are available from 44 to 750 r.p.m. in geometric progression. The main spindle is mounted on parallel roller bearings. The headstock contains a driving shaft, three intermediate shafts and the main spindle. On the driving shaft is mounted a multiple-disk clutch operated by a hand lever on the top of the headstock, for starting and stopping the lathe. When the clutch is released a brake is applied. Each of the first two intermediate shafts has a double multiple-disk clutch of the same type as that on the driving shaft. The clutch members on these shafts carry driving and driven gears near the ends of the shafts and close to the bearings. The third intermediate shaft has a double multiple-disk clutch which is self adjusting and spring-loaded to a definite slipping point. Below the intermediate shafts are three rods parallel with the shafts. These rods are supported in holes in which they can slide. Each rod carries a

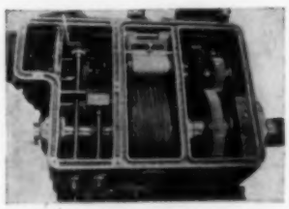
finger that operates the slider on one of the friction clutches on the three shafts. The fingers have lugs on their lower ends which are engaged by projections on the rims of the two selector disks mounted on a shaft carried in bearings below the sliding rods.

By means of gearing the selector disk can be turned by a small pilot wheel on the front of the headstock. The shaft for the pilot wheel carries a dial having eight spindle speeds marked in large figures. By turning the dial until any required speed comes opposite a pointer, the selector disks are set in the position which will allow the projections on their rims to move the fingers and engage those friction clutches which give the spindle speed corresponding with the figure on the dial. If the clutch lever is not moved the selector disks may be turned freely into any position by the pilot wheel without producing any effect on the spindle speed. This enables the dial to be set for the next spindle speed required while the previous operation is in progress. When this is completed a pull on the clutch lever instantly brings the new spindle speed into use.

Lathe Headstock, High-Speed

Gebrueder Bochringer, G.m.b.H., Goeppingen; Franz Braun A. G., Zerbst; Heidenreich & Harbeck, Hamburg, and H. Wohlenberg Komm. Ges., Hannover, Germany. (Vol.78,p.257E.) 126.

The association known as VDF (Vereinigte Drehbankfabriken) has developed a headstock design which is being built by the above four firms. The capacity range of a head-



stock of approximately 1 to 50 is ample so long as the diameter range on any given lathe is to cover jobs with the same properties. It is, however, not enough when the full diameter range is to cover jobs of varying characteristics, that is, jobs with high-speed steel tools and with tungsten-carbide tools, because the most favorable cutting speeds for the latter are four times as high as for the high-speed steel. Therefore, in this headstock, two parallel speed zones are available, on which the lower serves for rough-turning, the drive being transmitted to the spindle by means of spur wheels, while the higher speed zone serves for fine-turning at high speeds and with tungsten-carbide tools. The total capacity range of headstock is about 1 to 125. For a standard lathe of 14¾ in. height in centers, and 98½ in. between centers, the speed zones are as follows:

Rev. Per Min.

Fine-turning zone, belt drive to spindle.			
750	600	475	375
300	235	190	150
118	95	75	60

Rough-turning zone, spur-wheel drive to spindle.			
118	95	75	60
47.5	37.5	30	23.5
19	15	11.8	9.5

Grinding Attachment for Lathes

A. M. Collins & Co., 63 Farringdon St., London, E.C., England. (Vol.78,p.208E.) F-109.

The Coll-Ace lathe grinding attachment may be used for external or internal work by interchanging the grinding spindle. At one end the attachment is fork-shaped to take the motor by a bolt. Wheels may be interchanged readily. The speed for external grinding is 10,000 r.p.m., while for internal grinding a 3 to 1 ratio provides a speed of 30,000 r.p.m. The grinding spindle is mounted on ball bearings. The external wheel is 4 in. in diameter by ½ in. face by ⅜ in. hole, while for internal work the five grinding wheels range from 3 to 1 in.

Milling Machines

Milling Machine, Plain, Electric

Adcock & Shipley, Leicester, England. (Vol.78,p.496E.)

The No. 1 machine has a longitudinal feed of 7 in., transverse movement of 4 in., and vertical movement of 7 in. Working surface of table, 15x5 in. Drive by 1-hp. motor.

Twelve spindle speeds from 250 to 2,500 r.p.m. Maximum distance between center of spindle to table, 7½ in. Distance from center of spindle to underside of arm, 4¾ in.

Milling Machine, Manufacturing, Hydraulic

S. Wolf & Co., Ltd., London, S.E., England. (Vol.78,p. 254E.) F-122.

Wanderer-Werke, Schonau-Chemnitz, Germany, build this milling machine with hydraulic drive to the table, hydraulic motion for raising and lowering

the spindle head, hydraulic clamping of the head, and hydraulic engagement of the milling spindle. The table is 14¾ in. by 39¾ in., the longitudinal travel being 33¼ in. The spindle has 18 speeds from 15 to 750 r.p.m., and the feeds are adjustable up to 39¾ in. per min., with rapid return at about 30 ft. per min. The piston is under oil pressure on both sides, so that milling can be undertaken either way. The normal power requirements are 15 hp. The cycle is automatic at the engagement of a single lever.

Milling Machine, Manufacturing, Duplex

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.593E.)

This manufacturing milling machine has a complete automatic cycle of table movement. Large or small cutters can be used on non-ferrous materials, as well as cast iron or steel. The machine is built in either single or duplex form. The spindle runs on two roller journal bearings. Different diameters of arbor can be ac-

commodated by interchangeable bushings. The table is traversed by a non-rotating feed screw. Rate of feed is varied by pick-off gears. When built as a duplex machine the main driving shaft has an extension running along the back of the bed for driving the second spindle head through spiral bevel gears. Longitudinal feed of the table is 36 in.; transverse adjustment of column, 4 in.; maximum distance from spindle to table, 12 in.; minimum distance from spindle to table, 3 in.; number of spindle speeds, 16; and number of automatic feeds, 18.

Milling Machine, Manufacturing

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.662E.) F-275.

In this Craven-Rigid manufacturing milling machine the feed is infinitely variable. The table, 86¾ in. by 23¾ in., has automatic longitudinal traverse of 70¾ in. by means of a fixed screw and revolving nut. The spindle is mounted on a carrier, the vertical traverse of which on the column is 13¾ in. Cross adjustment of the spindle is obtained by advancing a quill, adjustment being 7¼ in. axially.

The drive is by 20-hp. motor. Spindle speeds are in three ranges, the lowest being from 15 to 150 r.p.m., and the highest from 30 to 300 r.p.m. Longitudinal feeds range from ⅛ to 19⅛ in. per min., or at twice these rates. An intermittent feed cycle is provided by hydraulically controlled trips.

Milling Machine, Universal

J. Parkinson & Son, Shipley, England. (Vol.77,p.785E.) F-33.

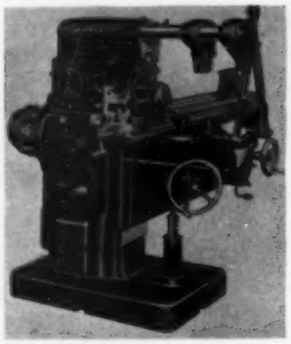
The table measures 46 x 10½ in., and has movements of 25 by 9 in. by 18 in. The 12 spindle speeds range from 17 to 450 r.p.m. Changes of speed are made by sliding gears and are shown on direct-reading dial. With the overarm shown the largest cutter that can be used is 12 in. The table swivels 45 deg. on each side of the center. Distance from the face of the column to the other brace is 20 in. The feeds provided are eight in each direction and may be in either of two ranges, one

double the other. The lower ranges are ⅛ in. to 7¼ in. per min. longitudinal, 5¼ to 5 in. per min. cross and 5/32 in. to 2¼ in. per min. vertical. Rapid power traverses are at the rate of 100 in. per min. longitudinally, 66 in. per min. cross and 33 in. per min. vertical. The universal dividing head will swing 12 in. in diameter and pass 1 in. through the hole. The centers admit 26 in. The head will swivel from 5 deg. below the horizontal to 50 deg. beyond the vertical and may be used for milling spirals at any angles between these values. The head may also be set at right angles on the table.

Milling Machine, Universal, Light-Type, No. 2

Buck & Hickman, Ltd., Whitechapel Road, London, E., England. (Vol.78,p.606E.) F-217.

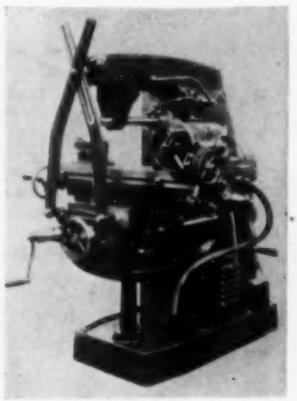
See page 82 of the American section for a description of this machine.



Milling Machine, Universal, Edgewick

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.609E.) F-221.

Feed and speed levers are grouped together on the Edgewick universal machine. Automatic longitudinal and cross feeds are provided to the table. The swivel block on the dividing head swings from 5 deg. below the horizontal to 50 deg. beyond the vertical. The dividing plate has holes on both sides, and the baseplate is pro-

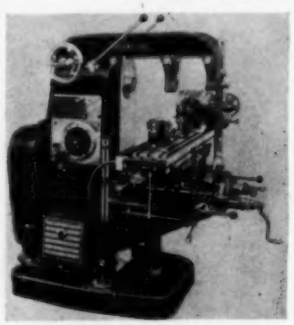


vided with a device for setting the head at any angle from the center of the table. Working surface of table, 40x10¼ in.; automatic longitudinal feed, 25 in.; automatic cross feed, 7¼ in.; vertical feed, 17 in.; angular adjustment of table each side of center line, 47 deg.; center of spindle to arm, 6¼ in.; maximum distance from face of column to arm brace, 22 in.; spindle speeds in nine steps from ½ to 9¼ in. per min. Power required, 3 hp.; floor space, 7 ft. 6 in. by 5 ft. 6 in.; net weight 3,580 lb. Dividing head swings 9¼ in.; admits 19 in.

Milling Machine, Universal, Parkson

J. Parkinson & Son, Shipley, England. (Vol.78,p.530E.)

Table movements, 25 in. longitudinal, 9 in. cross and 18 in. vertical. Drive is by a 3-hp. motor. The 12 spindle speeds, 17 to 150 r.p.m., are obtained through sliding gears, the changes being made by direct-reading dial. The table can swivel 45 deg. on each side of the center. Center height of the universal dividing head is 6 in., the spindle having a hole 1⅛ in. The headstock is arranged for plain and differential indexing. The head swivels from 5 deg. below the horizontal to 50 deg. beyond the vertical and may be used for milling spirals at any angle between these values. Tailstock has vertical and angular adjustment

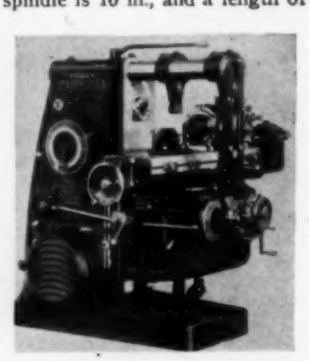


for setting in line with the dividing head for milling tapers. The table is 46 in. long by 10¼ in. wide, and from the face of the column to the arm brace is 20 in. Rapid power traverse, 100 in. per min. longitudinally, 66 in. per min. cross, and 33 in. per min. vertically.

Milling Machine, Universal, Milwaukee

Burton, Griffiths & Co., Ltd., Birmingham, England. (Vol. 78,p.635E.) F-246.

This No. 2K universal milling machine, built by Kearney & Trecker, is designed for high-speed toolroom or laboratory work. The table has a working surface of 56x12 in. The dividing head is fitted with hypoid bevel gear and nitrided pinion with a ratio of 5 to 1. Swing of the dividing head spindle is 10 in., and a length of



35½ in. may be accommodated. Quick indexing is provided for all numbers up to 500. The 27 spindle speeds range in geometrical progression from 15 to 1,500 r.p.m. Some 40,000 distinct leads are available, ranging from 38 turns to the inch to one turn in 2,900 in. Threads as fine as 38 to the inch can be milled. Longitudinal, cross and vertical movements are: 28, 10, and 17 in., respectively.

Milling Machine, Planer-Type, Universal

Ward, Haggas & Smith, Keighley, England. (Vol.78, p.274E.) F-133.

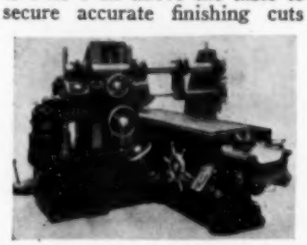
The capacity of this machine is 7 ft. by 4 ft. 3 in. wide, by 3 ft. high. It has one saddle on the cross-rail and one on the right-hand upright. The table is traversed by a worm-rack motion. The vertical saddle has sufficient travel on the cross-rail to allow a 12 in. face cutter to be started from either end clear of the widest work, and it can be traversed across to clear the work at the other side. The spindles have 6 in. adjustment.

They are 2½ in. in diameter. Twelve spindle speeds range from 20 to 150 r.p.m. The twelve feeds vary from 1 to 8 in. per min. for the table and from ½ to 4 in. per min. for the saddles. Each slide has independent reverse. Rapid power traverse motions are provided for the cross-rail, table and both saddles. Maximum distance from the vertical spindle nose to the table top is 3 ft. 4½ in., and from the horizontal spindle center to the table top, 2 ft. 10½ in., the minimum distance in each case being zero.

Milling Machine, Planer-Type

Kendall & Gent, Ltd., Manchester, England. (Vol.78, p.594E.) F-211.

The table is 6 ft. long over the T-slotted part and 2 ft. 3 in. wide over-all. The arbor center is 1 ft. 6 in. above the table to secure accurate finishing cuts without altering the alignment of the cutters. Bed and table are pivoted. Thus, the bed and table can be slightly raised and lowered. This is accomplished by a jack screw placed vertically below the spindle. The bed and table tilt together so that the latter still moves in a plane parallel to the axis of the cutters. Range of spindle speeds, 30 to 360 r.p.m. Feed motion for the table is obtained from a constant-speed motor coupled to a nine-speed gearbox. Feeds range from 1½ to 10 in. per min.



Milling Machine, Vertical

Craven Bros. (Manchester), Ltd., Reddish, near Stockport, England. (Vol.77,p.666E.) F1.

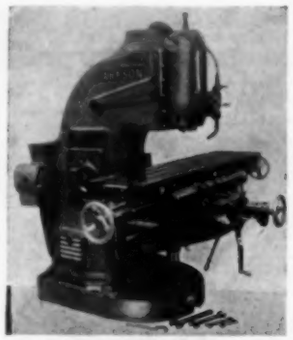
These all-geared machines with built-in electrical equipment are for use with "Wimet" and high-speed cutters. A separate motor provides speed and quick traverse drive, but the feed is automatically disengaged should the spindle motor be

stopped with the feed in operation. Unit construction has been adopted. The spindle slide is balanced and has both fine and quick adjustment by hand, with quick-locking arrangement and vernier for setting the depth of cut. A cutter mandrel support is provided for profiling and other slab milling operations. The machines are built in three sizes: No. 1 with a 2½-in. spindle driven by a 10-hp. main motor; No. 2 with a 3½-in. spindle driven by a 15-hp. motor, and No. 3 with a 4-in. spindle driven by a 20-hp. motor. Each machine has 16 spindle speeds, ranging in the smallest model from 20 to 300 r.p.m., and in the largest model from 15 to 250 r.p.m. The smallest machine has 12 feeds ranging from 1 to 16 in. per min., while the other two machines have 16 feeds with a range from 1½ to 24 in. per min.

Milling Machine, Vertical

J. Parkinson & Son, Shipley, England. (Vol.77,p.770E.)

Table working surface 16½ by 70 in.; table movements, 40 in. longitudinal, 12 in. cross and 18 in. vertical, milling-head vertical travel, 6 in. Distance from the spindle center to the column measure, 18 in. Power

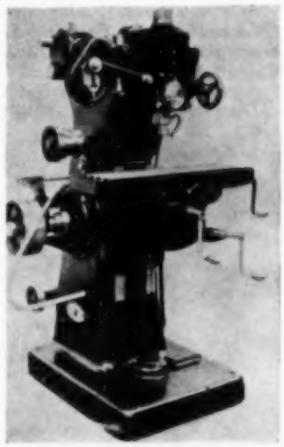


feeds and rapid power traverses are provided for all table movements. These motions can be controlled from four positions. A multiple-disk friction clutch with brake is used for starting and stopping the spindle. Speed changes are effected by means of a lever and dial through sliding gears. The 16 spindle speeds range from 17 to 450 r.p.m. The 16 table feeds range from ½ to 15 in. per min. A high speed attachment can be supplied, the spindle speeds then ranging from 56 to 1,480 r.p.m.

Milling Machine, Keyway, Edgwick

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.120E.)

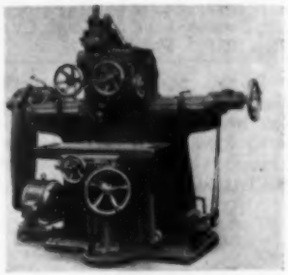
The machine is intended for general work and in particular for producing slots, keyways, splines, deep holes, and recesses. It can be used on punch and die work. The operation is automatic, the cutter traversing along the work backwards and forwards and advancing in depth at each reversal. Maximum length of cutter is 5 in. for automatic control, and up to 20 in. with hand adjustments. Maximum width of keyway cut is ¾ in., and maximum depth of automatic may be 3½ in. The headstock has a long bearing on narrow ways to insure cutter alignment. On motor driven machines eight speeds range from 300 to 2,000 r.p.m. The table has a working surface of 26x6¾ in., and the maximum distance between the spindle nose and the table surface is 14 in.



Milling Machine, Keyway

G. Richards & Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p.680E.)

This machine works on the one cut system, the cutter sinking to the required depth of the work and then feeding horizontally automatically. Keyways up to 2 in. wide and 30 in. long can be produced. Only one size of collet is used, smaller shanks being accommodated by split

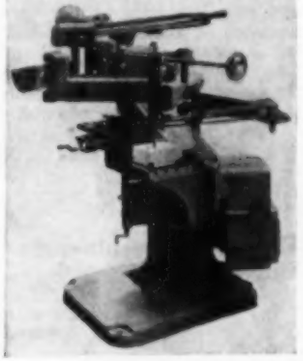


bushings. Nine spindle speeds range from 140 to 754 r.p.m. The spindle has a vertical adjustment of 5½ in. The table is 36 in. by 12 in., and has a 14 in. vertical adjustment. Cross adjustment is 5½ in. for irregular work and for work carried in special jigs. Maximum distance from the spindle nose to the table is 18 in.

Milling and Diesinking Machine, Pantograph-Type

Alfred Herbert, Ltd., Coventry, England. (Vol.77,p.725E.)

Sold by the above firm but manufactured by Taylor, Taylor and Hobson, Ltd., of Leicester, this machine employs a pantograph mechanism with reduction variable from 1½ to 1, down to 10 to 1. Rotating parts of the



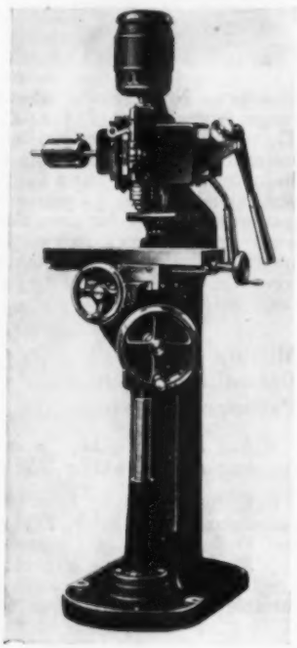
pantograph are carried in ball bearings, and the spindle and stylus may be interchanged so that a copy at an enlarged scale can be obtained. The cutter spindle will take cutters having a No. 5 B&S shank and held in position with a draw bolt. For holding small cutters having parallel shanks a collet fitting is provided. Motion of the spindle horizontally is controlled by the pantograph, but

vertical motion is available controlled by a counterweighted beam extending across the top of the machine. The worktable is 15x8 in., and has horizontal motions of 16 by 8 in., and vertical motion of 10 in. Nine spindle speeds are obtainable in geometric progression from 600 to 6,000 r.p.m.

Milling Machine, Profiling and Diesinking

W. H. Eveson, 30 Paradise St., Birmingham, England. (Vol. 78,p.103E.) F-75.

In this Nube hand-controlled diesinking, profiling and copying machine, the table is 10 in. long by 8 in. wide, and has a traverse by handwheel of 10½ in. Above it the milling spindle

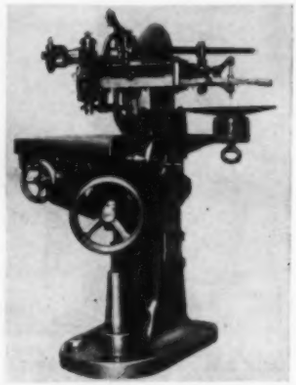


and the profiling roller are mounted on a slide. The spindle is adjustable vertically 2 in. The copying pin is carried on the same slide and is adjustable both vertically and horizontally by a micrometer screw. Traverse of the spindle slide is 15 in. For copying purposes the ratio is 1 to 1.

Engraving Machine, Universal

W. H. Eveson, 30 Paradise St., Birmingham, England. (Vol.78,p.163E.) F95.

This Curd-Nube universal pantograph engraving machine is built in two sizes. The smaller engraves a surface 4¾ in. by 4¾ in., and the larger machine 9⅛ in. by 11¾ in. The milling spindle in each machine has two speeds, namely 5,000 and 14,000 r.p.m. Besides copying in full size, the two machines will reduce in any ratio down to 1 to 10. Flat, raised and sunk work can be done and any material

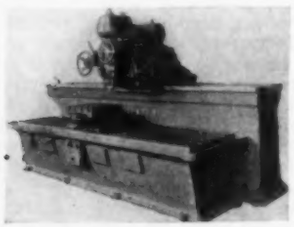


can be cut. The machine can work under three dimensions, the pantograph always remaining horizontal. Vertical adjustment is provided both for the working table and the pattern table, and the latter can be moved longitudinally. Maximum distance between table and spindle 12⅝ in.

Milling Machine, Crankshaft Die-Block

Droop & Rein, Bielefeld, Germany. (Vol.78,p.258E.) F127.

This machine is intended for milling out heavy die blocks used in the manufacture of crankshafts and similar stampings. The heavy block remains bolted to the table during the



machining operation while the milling spindle has a movement both longitudinal and crosswise. Eight working speeds are arranged in two groups: 40 to 141 r.p.m. and 85 to 301 r.p.m. Travel of the saddle is 118 in., and 21½ in. crosswise, while the table is 118 in. by 31½ in.

Milling Machine, Profile, Vertical-Spindle

Worson Co., 30 Paradise St., Birmingham, England. (Vol.78, p.364E.) F-158.

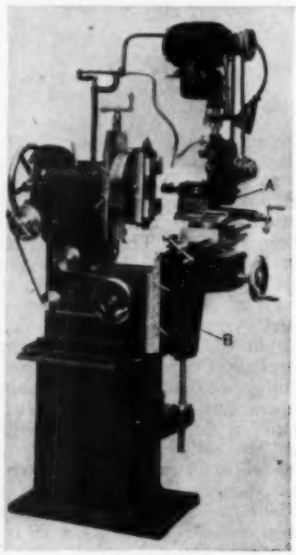
This vertical-spindle milling

machine built by the firm of Curd Nube, Offenbach-on-Main, Germany, is used for production of cams and other forms. Six spindle speeds range from 70 to 500 r.p.m. For each speed eight feeds are provided by a gearbox. From this box is driven the copying table. This has a continuous circular motion controlled by adjustable stops. The pattern can be cut on the machine itself, and the diameter of the pattern is 27½ in.

Milling Machine, Tool and Die

B. Elliott & Co., Ltd., York Rd., London, N., England. (Vol.78,p.482E.) F-182.

This "Excel" universal tool and die milling machine has universal movements both to the workholder and the milling spindle to enable the machining of press tools for forming, drawing, cutting dies and diecasting and other molds, embossing tools and jigs. The column T-slots accommodate the cutter slide and a vertically projecting pedestal with bearing to take the work-holding fixture. The latter consists of a main spindle which may be rotated

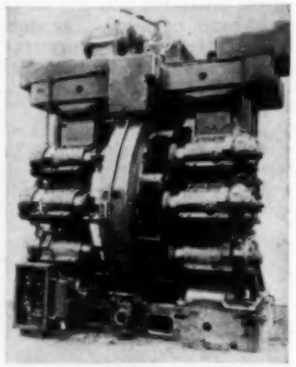


in the column by handwheel and clamped to give any required angular setting for the work. At the front of the spindle is mounted the work-holding device, and a self-centering parallel vise, three-jaw chuck and universal vise are interchangeable. The device consists of a main slide with cross movement and this slide carries a supplementary slide on which the work-holder is mounted. It is arranged to swivel and a division plate with 24 holes, together with an index pin, enables the work to be set to the required angle. Furthermore, the supplementary slide can be adjusted on each side of the main axis for the purpose of obtaining eccentrically disposed surfaces, and these may be either circular or flat-milled. The milling cutter head is mounted on a compound swivelling slide whereby cuts may be taken in any direction.

Milling Machine, Cylinder-Block, Drum-Type

J. Holroyd & Co., Ltd., Milnrow, near Rochdale, England. (Vol.78,p.363E.) F-156.

At separate operations the machine finish-mills from the rough both the top and the bottom faces of the blocks, these being mounted on fixtures and the drum continuously rotated. On each side the drum carries nine blocks. On the left side jigs carry blocks for milling

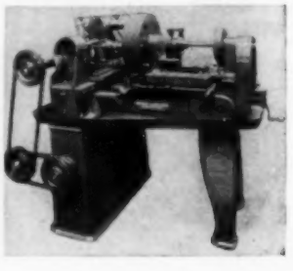


the sump face, and at the right side the blocks are milled for the cylinder heads. The cutter spindles have a horizontal adjustment of 4½ in. Normally the drum rotates at 4½ rev. per hr., the feed being 18 to 33 in. per min. The main drive is by a 40-hp. motor. The milling is done on each side of the machine by three inserted-tooth cutters with tungsten-carbide tipped blades.

Milling Machine, Semi-Automatic for Twist Drills

Herbert Hunt & Sons, Old Trafford, Manchester, England. (Vol.78,p.589E.) F205B.

This semi-automatic machine is for fluting and clearance milling of twist drills from ⅛ to ½ in. diameter. Two fluting heads and two clearance milling heads operate on four blanks at the same time, a drill being finished at every advance and return of the workhead. To facilitate

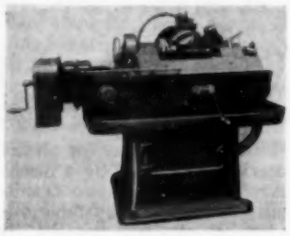


loading and unloading a six-spindle turret has chucks fitted on each spindle. Two fluting heads are arranged opposite each other and can be adjusted to suit the angle of spiral. The two clearance milling heads operate on blanks at the two lower spindle positions.

Milling Machine, Worm and Screw

J. Holroyd & Co., Ltd., Milnrow, near Rochdale, England. (Vol.78,p.146E.) F-89.

This larger worm and screw milling machine is suitable for work up to 4½ in. in diameter by 12 in. long. Leads cut are up to 10 in., and splines and circular racks can be produced. The machine is used for milling the threads of screws and worms of square, Acme, V, knuckle, buttress or other forms.



Work is carried between the centers of fast and loose headstocks, mounted on a traversing table and controlled in pitch by change wheels between the fast headstock spindle and the leadscrew. The spindle is hollow and can take a three-jaw chuck or collet to suit bar work. A dividing motion on the workhead facilitates the cutting of multi-start threads. For cutting left-hand threads an extra intermediate gear is placed in the lead change wheel on the quadrant plate. The head will swivel through 180 deg. for setting to any angle of thread from splines to annular grooves. Micrometor stops enable the cutter to be withdrawn and quickly returned to the same depth on repetition work. The drive is by a 2-hp. reversible motor inclosed in a cabinet under the bed.

Etching Device, Javelin, Electric

Taylor, Taylor & Hobson, Ltd., Leicester, England. (Vol. 78,p.192E.) F-101.

A device having a single javelin which can be employed on an engraving machine in place of the cutter is offered. The javelin is projected or vibrated over the work at the frequency of the electrical supply. The unit has a circular stem which takes the place of the cutter spindle, and the javelin is lightly clipped to a spring piece. The voltage required ranges from 2 to 6, according to the depth of marking and the material. The javelin adapts itself automatically to the surface to be etched, so that cylindrical objects can be marked, as well as flat surfaces. Markings required are usually only a few thousandths of an inch deep, but considerably deeper etchings can be obtained.

The instrument works by vaporizing a small amount of material, with uniformity of width and depth of marking and without burr. No skill is required from the operator, and since no cutting strain is imposed no precise guidance is needed. While for effect a polished surface is required, the marking can be done without damaging the work. When following the surface under treatment, the javelin takes up its own wear, and is thus self adjusting.

Grinding Attachment

Loranco, Ltd., 30 Sydenham Road, London, S.E., England. (Vol.78,p.333E.) F-148.

Designed for grinding splines in shafts and gears after heat-treatment, and oil-grooving, this grinder is shown mounted in the spindle of a vertical milling machine for grinding a keyway. The tool can also be used in the spindle of a drilling machine or in the headstock of a lathe, the work being mounted on the saddle. It consists of a spindle with a center bore which forms

the air passage. The air enters at the nozzle *A*, passes down the spindle and impinges on the rotor at the bottom. The speed is 140,000 r.p.m. The grinding wheel may be replaced by rotary files of various shapes and sizes. The smallest tool takes wheels up to 8 mm., and operates in a hole as small as 1¼ in. The largest has a spindle of 60 mm. and takes wheels up to 30 mm. in diameter.

Index Centers, Triple

J. Parkinson & Son, Shipley, England. (Vol.78,p.287E.) F-

These triple index centers are for direct indexing only on milling or other machines. The unit comprises a three-spindle headstock and tailstock with locating tongues and holding-down bolts. The spindles are indexed simultaneously by means of a hand lever. The spindles have No. 9 Brown & Sharpe taper holes, and ejecting holes are provided for the three centers. The height of centers is 2½ in., and the horizontal distance between them is 2¾ in. Thus with

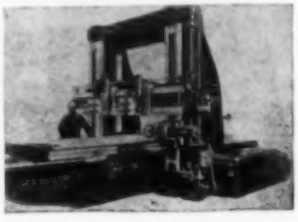
the outer spindles only in use, work up to 5 in. in diameter can be mounted.

Planers and Shapers

Planer with Hydraulic Drive

H. A. Waldrich, G.m.b.H., Siegen, Germany. (Vol.78,p. 131E.) F-85.

This double-column planer has a machining width of 5 ft. by 13 ft. long. The table is reciprocated by means of a cylinder underneath. Cutting and return speeds can be adjusted independently, the range for each being from 10 to 195 ft. per min.

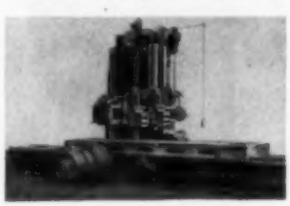


Quick reversal and short stroking are features of the machine. Two toolholders are provided on the cross-member, with one toolholder on the right-hand column. All are automatically operated by the firm's feed system.

Planers, Electric Drive

J. Stirk & Sons, Ltd., Halifax, England. (Vol.78,p.676E.)

The Hiloplane openside planer illustrated is rated at 50 x 50 in., by 120 in. It cuts at more than 300 ft. per min. with a quick return. Transmission is by keyless helical driving gears and rack. Electro-magnetic toollifters are fitted. The drive is by the firm's split-field system on the Ward-Leonard principle. The equipment consists of a unit-type motor-generator delivering variable-voltage continuous current. A disk and master switch actuate two contactors which provide for cutting stroke and quick return reverse to the table motor. The field windings, both of the generator and final motor are divided into two sections. On the generator these sections are connected to oppose each other, so that alternating polarity results from the alternative excitation of the two sections. The two sections of the motor field are connected to agree and one is permanently excited. The second section is excited during the cutting stroke only, and a suitable cutting speed and a quick return are thereby provided. The range of the system may be extended indefinitely by variation of the generator voltage. Two shunt regulators enable cutting and return speeds to be varied independently. Reversals are made without shock owing to a dynamic cushioning device which gives automatic adjustment according to the varying conditions of speed, length of stroke, and load on table.

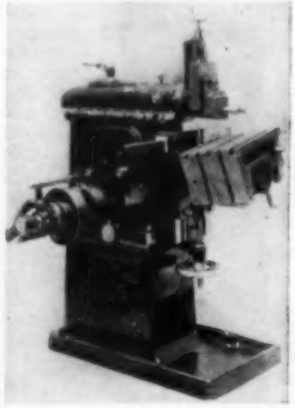


The firm also builds the Hiloplow, a medium pattern machine for moderate speeds, with transmission by the Stellar system. The Ingoplow is an extra heavy pattern, specially designed for machining hard ingots and similar work. The last two machines are of the cross-rail type.

Shaper, Horizontal, 9-In. Stroke

Ormerod Shapers, Ltd., Hebden Bridge, England. (Vol.78, p.574E.) F-204.

This 9-in. stroke, toolroom shaper has better control positions to all movements and speed and feed changes, compound

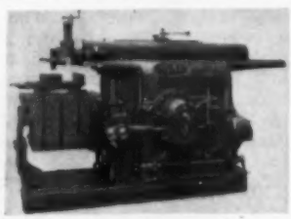


quick-return motion to the ram, universal swiveling table, self-acting feed to toolbox, increased length and width of all bearing surfaces, and single pulley drive with friction clutch and brake. Ram speeds vary from 44 to 109 strokes per min. The table is 12 in. by 10 in. by 8½ in. deep and has a swiveling movement through 180 deg. The top face may be tilted to an angle of 15 deg. Horizontal traverse of the table on the cross-rail is 16 in.

Shaper, Horizontal, 32-In.

Butler Machine Tool Co., Ltd., Halifax, England. (Vol. 78,p.660E.) F-272.

The machine is driven through a single friction-clutch pulley and eight-speed unit gearbox. The available cycles range from 7 to 87 per min. A cam feed is fitted and the rate can be changed while the machine is in



motion. In addition to the standard toolbox, which is of the single-post type and arranged to swivel through 90 deg., a number of other types for special purposes are available. The table is 30 in. by 20 in. on top by 21 by 20 in. at the sides. Its horizontal travel on slides is 30 in., and the vertical travel is 15 in. It admits 18 in. on top, the toolbox having a vertical adjustment of 9 in.

Shaper, Vertical, 6-In.

Ormerod Shapers, Ltd., Hebden Bridge, England. (Vol.78,p. 511E.) F-191.

This high-speed vertical shaper admits work 24 in. in diameter by 10 in. high. Cutting strokes are 35, 52 and 70 per min. Transverse motion of the table

is 12 in., and longitudinal traverse, 10½ in. The table periphery is graduated to 360 deg. The circular traverse of the table is by worm gear. Belt or motor drive can be furnished. Length of stroke can be altered while the machine is in motion. Cutting tools are 1 x ¾ in. section.

Presses

Press, Arbor, Rex

Adcock & Shipley, Leicester, England. (Vol.78,p.457E.)

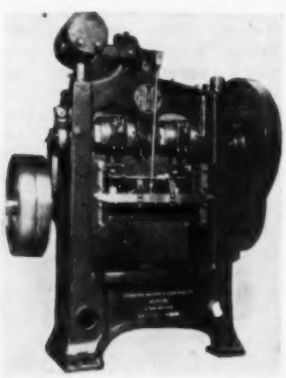
The largest size is illustrated. The ram is 3 in. in diameter and has a traverse of 16 in., the maximum leverage exerted being 150 to 1. The press admits 26 in. in diameter by 30 in., and

the largest mandrel dealt with is 4 in. in diameter. The smallest machine is for bench mounting, and its capacity is 8 in. in diameter by 8 in., and a 1 in. mandrel. Three other sizes are available.

Press, Double-Crank, Variable-Stroke

Hordern, Mason & Edwards, Ltd., Erdington, Birmingham, England. (Vol.78,p.52E.) F-51.

This 150-ton variable-stroke press has a frame made of a one-piece semi-steel casting, reinforced with four shrunk-in steel tie-rods. The steel connecting rods are bushed with phosphor-bronze, and the vertical adjustments for the two



rods are synchronized by worm gears operating through a ratchet. Stroke variation of the crankshaft enables the machine to be adapted to the work instead of the work to the machine. Thus, blanking operations are performed on a short stroke, while a longer stroke is available for drawing operations. There are five variations, from 1 to 6 in., and each change can be made in about 45 sec. Width between uprights, 45 in.; size of slide for tools, 20 by 33½ in.; size of table, 44 by 33 in.; distance from table to slide guides, 13½ in.; strokes per min., 28; power required, 10 hp.; net weight, 9¾ tons.

Press, Double-Crank

Taylor & Challen, Ltd., Birmingham, England. (Vol.78,p. 51E.) F-46.

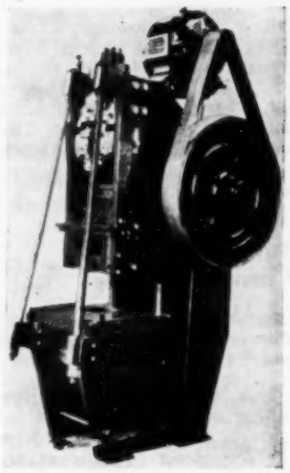
The press is driven by a motor on the top bracket, the crankshaft being driven from the backshaft through single gearing. The slide is balanced by

long compression springs which work in tubes on each side of the press. Quick-acting adjustment of the slide is 4 in. Width between uprights is 4 ft., 7½ in., and the bed from front to back measures 4 ft., and has a cored hole 4 ft. by 2 ft.

Press, Toggle, 60-Ton

Mass Products, Ltd., Newtown, Parkstone, England. (Vol. 78,p.53E.) F-53.

This Humphris 60-ton press is of the gap type and the ram is actuated by a toggle system. As a consequence the ram deflection is said to be eliminated, bearing area is increased, a squeeze replaces a hammer blow, and a lower power input is feasible. Blanking capacity in mild steel is 13 in. in diameter

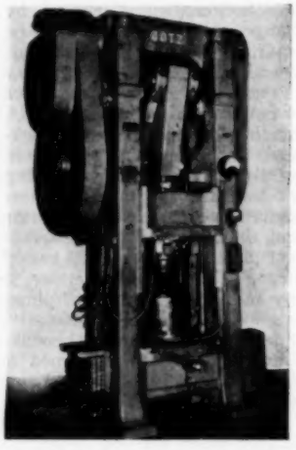


by No. 15 I.W.G.; area of cut, 3 sq.in.; standard stroke, 3 in.; maximum stroke, 5 in.; strokes per min., 80 to 120; size of ram face, 13¾ by 10 in.; size of press bed, 28 x 28 in., and power required, 4 to 6 hp.

Presses, Molding

Gebr. Gotz, Lauter i. Sa., Germany. (Vol.78,p.441E.) F-170.

This molding press for plastic materials is acuated by a mechanism consisting of two crankshafts and a fine adjustable oil-hydraulic clutch. Motion is transmitted from one driven crankshaft by connecting rods to the second crankshaft. The

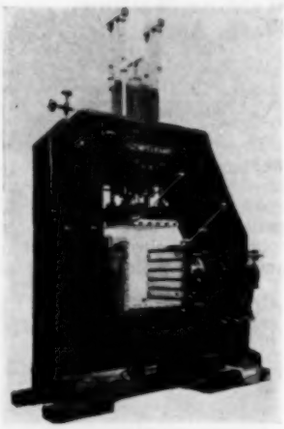


two shafts do not work in the same phase, allowing a quick approach of the ram and a retarded working stroke, but at the same time greatly increased pressure is obtained. At the return stroke the motion of the ram is at first retarded and the molded piece can be removed easily. The largest mechanical press yet manufactured is of 200-tons pressure.

Press, Molding, Universal

G. Siempelkamp & Co., Krefeld, Germany. (Vol.77,p.725E.)

This universal press is intended for molding complicated articles in molds consisting of several members. Four clamp-

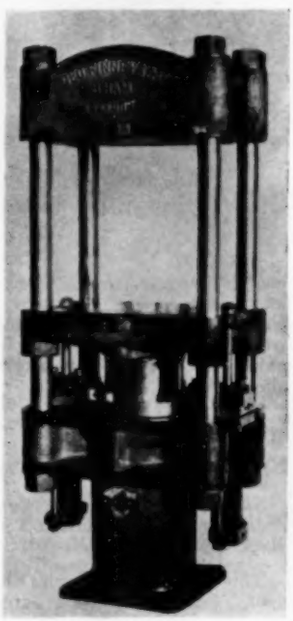


ing plates are provided, two being movable by hydraulically actuated plungers. The horizontal plunger shown holds the die members together during the pressing operation performed by the vertical plunger. A closed steel frame absorbs the forces. The clamping plate may be equipped with heating and cooling arrangements, and an hydraulic ejecting device may be incorporated. The horizontal plunger exerts a pressure of 100 metric tons, and the vertical plunger 50 metric tons.

Molding Press, Pre-Filling, 80-Ton

G. Finney & Co., Birmingham, England. (Vol.78,p.54E.)

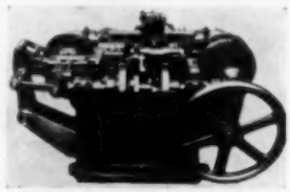
This 80-ton, up-stroke, pre-filling press has a 10½ in. ram, giving a 12-in. stroke. The platens are 18 in. sq. The press is operated by a combined pre-filling and control valve of the cam-operated type. Double-acting cylinders at the side close the mold rapidly, and high-pressure is admitted only for the final pressing phase. On completion of the cure, the main ram and undersides of the side cylinders are opened to exhaust, and the constant pressure on the top of the side cylinders breaks open the mold and also operates the ejector gear.



Multi-Slide Machine, Automatic

Heenan & Froude, Ltd., Worcester, England. (Vol.78,p. 510E.) F-190.

The machine is made in four sizes, the smallest dealing with strip 1½ in. by 1/64 in., and the largest, strip 2½ in., by 1/16 in. A horizontal press is located between the feeding mechanism and the final shear head to perform the initial operation of punching out the contour of the blanks together with any spot holes, indentation and lettering.



An entirely free and automatic outlet for waste material or punchings from the tools is provided by offsetting the punching press from the centerline of the other tools. After the first operation the strip is returned to the operating centerline by the following center tool, which is fitted to a spring-loaded moving head. The first motion of the front slide presses the strip into contact with the center tool, which then moves over with the front slide until the center tool head makes contact with an adjustable stop. The front slide then continues its motion and performs the first bending operation, after which the remaining slides and stripping device come into action in the usual way. In the improved design the forward and return movements of the various slides are effected by separate cams set side by side and dowelled together. Whenever possible solid-die tools are employed.

Press Guard, Automatic

J. P. Udal, 45 Upper Dean St., Birmingham, England. (Vol. 78,p.41E.) F-44.

For use on large long-stroke presses, this automatic guard has a safety action obtained by an outward and downward sweeping movement of a double lever system. Being mounted on the slide of the press, the guard has, in addition to the movement mentioned, the advantage of the fall of the press slide as it makes its stroke. In consequence, the guard lever can be made relatively short. At top stroke the guard folds up under the slide and does not impede the operator in handling bulky work.

Saws

Sawing Machine, Cold, 20-In.

S. Russell & Sons, Ltd., Leicester, England. (Vol.77,p. 684E.) F-6.

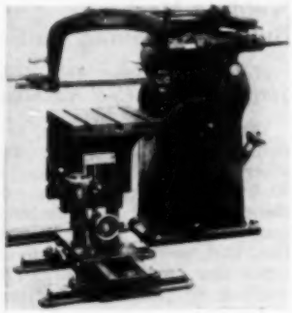
This 20-in. "Hydro Feed" cold saw is driven by a 7½-hp. motor. Four speeds range from 35 to 90 ft. per min., and the width of cut of the saw is 15/64 in. The feed is hydraulically

obtained, ranging to 12 in. per min., but can be increased to 30 in. per min. Dogs disengage the feed at the end of the cut and the saw carriage is returned by rapid traverse. It is claimed that the saw cannot be pulled into the work by the action of the cut. The vertical vise is hydraulically operated, and the vise block is forced down on the material through a toggle action. Floor space, 7 ft. by 3 ft. 4 in. The machine will cut rounds up to 6¾ in.

Sawing Machine, Gate

E. G. Herbert, Ltd., Levenshulme, Manchester, England. (Vol.78,p.417E.) F-166.

The Rapidor gate saw has the firm's automatic lift of the blade on the return stroke by means of an adjustable oil dashpot, also an adjustable device for regulating the pressure on the blade by means of a spring. An arrangement is provided for starting the cut on the sharp corners, and also an adjustable trip for automatically stopping the machine at any depth of cut. Blades from 13 to 16 in. long are used. The table, which is T-slotted on the top and side, measures 15 x 15 in. The vertical adjustment is 8 in., and horizontal movement 12 in.



Sawing Machine, High-Speed, "Viper"

Voucher, Ltd., Walsall, England. (Vol.78,p.469E.) F-179.

Light gage steel mouldings and stainless steel drawn on wood, and various non-ferrous sections can be cut with this "Viper" high-speed circular saw.

The saw is carried at the end of a swinging arm and is driven by a 3 hp. motor. Although usually mounted on a pedestal as shown, the machine is a self-contained unit and is portable. The arm can be swung in both directions or can be clamped to work in any vertical plane.

Sawing Machine, Cold, Hydraulic

Noble & Lund, Ltd., Felling-on-Tyne, England. (Vol.78,p. 604E.) F-214.

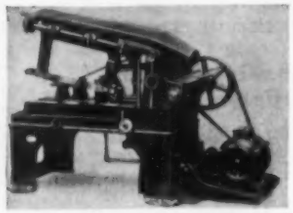
This hydraulic 24x28 in. cold sawing machine has an hydraulically actuated automatic feed to the saw carriage. The feed automatically adjusts itself to the section being cut. With a saw blade 24 in. in diameter the cutting capacity includes rounds up to to 8 in. in diameter. With a 28 in. saw blade the cutting capacity includes rounds up

to 10 in. in diameter. Power required, 10 hp.; four cutting speeds, from 40 to 90 ft. per min.; feed range up to 18 in. per min.; net weight, 3½ tons.

Sawing Machine, Hydraulic

Charles Wicksteed & Co., Ltd., Kettering, England. (Vol. 78,p.636E.) F-249.

This machine operates on a combined shear cut and gravity feed principle, and has a capacity on rounds of 10 in. diameter. The blade is set at an angle to the guide bars and as it moves through its cutting stroke the saw frame is raised against



an oil resistance, which is variable. A device incorporated in the hydraulic unit counter-balances the weight of the saw frame without interfering with the rate of cut, and by this means the blade may be allowed to "fall" on to a knife-edge, or the machine may operate on the work of varying sections without damage to the blade. Positive hydraulic relief on the idle stroke is provided. High-speed steel saw blades with six teeth per min., and measuring 19 in. by 1¼ in. are used.

Cutting-Off Machine, Abrasive-Wheel

Fredk. Pollard & Co., Leicester, England. (Vol.78,p.631E.)

This Meteor machine cuts off lengths of steel by the action of an abrasive wheel which is fed across the work by a lever, the work being held stationary. Pieces can be cut to specified

angles if required. The machine will cut up to 1½ in. diameter bars. Height 54 in.; weight, 500 lb.

Cutting-Off Machine, Portable

Turner Manufacturing Co., Wolverhampton, England. (Vol. 78,p.118E.) F-81.

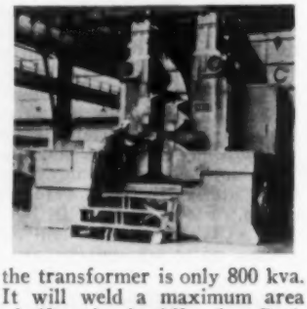
This portable cutting-off machine will deal with diameters up to 1¾ in., squares up to 1¼ in. A circular saw is set across the work from below. The drive is by ½-hp. motor. A friction device automatically adjusts the feed to suit the hardness of the material being cut. When the saw carriage is returned the drive is cut off, and when the drive is taken up again the feed is engaged. The jaws of the vise can swivel. A well beneath the saw is always filled with lubricant.

Welding Machines

Welding Machine, Butt, Automatic

Allgemeine Electrizitäts Gesellschaft, Berlin, Germany. (Vol.78,p.673E.) F-279.

Intended for manufacture of heavy anchor links and for welding large pipes to flanges, this fully automatic flash butt welder will weld an area of 40 sq.in. Automatic control reduces the peak load on the line, because the stock is pre-heated before flashing takes place. Thus, the intermittent rating of



the transformer is only 800 kva. It will weld a maximum area of 40 sq.in. in 16½ min. Both the upset pressure and the burn-off can be adjusted in a few moments without alteration of gear wheels or cams. For example, the maximum clamping pressure is 70 tons, and the maximum upset, 50 tons, both being adjustable for sections down to 4 sq.in., the smallest area that can be handled on a machine of this size. Weight, 40 tons.

Welding Machine, Butt, 30 Kw.

Holden & Hunt, Old Hill, Staffs, England. (Vol.78,p.52E.)

Welding of tubes, strips, sectional bars, angles, tees and other parts can be done on this 30 kw. flash butt welding machine. A special cadmium copper is used for the electrode tips, said to have from 8 to 12 times the life of copper. The machine will deal with sections

up to ¾ sq.in. Electrodes are water-cooled and can be fitted with renewable grips. Upsetting pressure is applied by means of an eccentric cam. A pedal is the sole means of electrical control, so that the operator's hands are free.

Welding Machine, Wire

British Electric Welding Machine, Ltd., Dudley, England. (Vol.78,p.68E.) F-58.

Offered for welding steel wires from 0.028 to 0.3 in. in diameter, the machine is rated at 6 kva. Clamps for holding the wire have renewable hardened copper electrodes and hardened steel quick-acting screw-type grips. Pressure to close the weld is applied to the left-hand swing-type moving head through an adjustable compression spring. The clamp can be opened a distance of 1½ in. to allow hard steel wire to be annealed after welding.

Welding Machine, Flash, Automatic

British Electric Welding Machines, Ltd., Dudley, England. (Vol.78,p.53E.) F-52.

In this fully automatic flash welding machine the moving head is carried in circular guides and bushings. The main units, which hold the clamping tools, are bolted to the fixed and moving platens, so that any

number of clamping tools may be employed for varying sections of work. Both the contact blocks and the gripping dies are of the quick changing type and the clamping heads are water-cooled. An electrically operated brake insures a precise stop and start movement. The time cycle varies from 1½ to 2½ sec.

Welding Machine, Seam

Soag Machine Tools, Ltd., 7 Juxon St., Lambeth, S.E., England. (Vol.78,p.637E.) F-250-B.

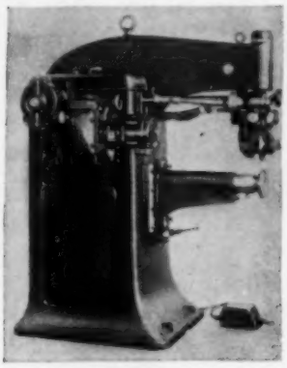
The seam welder of 25-kva. capacity will weld a total thickness of 5/32 in. Normal length of the arms 19¾ in., the maximum 29½ in. The machine operates by the mesh-seam

method, effected by a special interrupter switch. Thus, it is possible to weld metal surfaces which may be slightly rusty or oxidized. The welding current may be varied.

Welding Machine, Spot and Seam

Soag Machine Tools, Ltd., 7 Juxon St., Lambeth, S.E., England. (Vol. 78,p.637E.)

This heavy-duty welder for spot, longitudinal and cross



seam welding of bulky and irregular work has a capacity of 50 kva. Total welding thickness is $\frac{5}{8}$ in. Normal length of the arms is 23½ in.; maximum length, 47 in. To change from spot to seam welding, roller electrodes are fitted. To change from longitudinal to cross seam welding the upper electrode is swivelled 90 deg. and the lower electrode is changed. A plug switch with 15 steps allows the welding current to be adjusted to suit the thickness of material.

Welding Machine, Spot

Soag Machine Tools, Ltd., 7 Juxon St., Lambeth, S.E., England. (Vol.78,p.637E.) F-250-A.

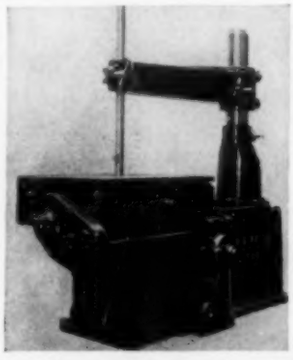
This welder of 25 kva. capacity will weld a total thickness of $\frac{3}{4}$ in. An output of 200 spots per min. can be obtained. The welding stroke is effected by motor drive through a crank fitted in the top arm. Normal stroke of the electrode is $\frac{1}{2}$ in., but it may be increased to $1\frac{1}{16}$ in. for bulky work. Single spots, or a row of spots (stitch weld), can be obtained.

Other Machines

Keyseating Machine, Vertical

Carter & Wright, Ltd., Halifax, England. (Vol.77,p.668E.)

The machine cuts keyways up to 30 in. long by 2 in. wide in pulleys, and also cuts skew keyways on the arms of rotor castings. Drive is by a 5-hp. variable-speed motor through spur reduction gears to the driving shaft. Reverse gears give a quick return of 2 to 1.

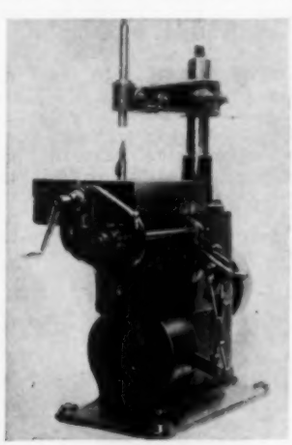


Cutting speeds range from 25 to 45 per min. Stroke of the slide is adjustable by a reverse clutch. The upper cutterbar support can be raised and lowered on the pillar and swung clear of the work. Table working surface 3 ft. 6 in. by 2 ft. 3 in. Power traverse is provided towards the cutting tool and hand traverse at right angles. The feed is adjustable from 0.004 to 0.04 in.

Keyseating Machine, Vertical

Carter & Wright, Ltd., Halifax, England. (Vol.78,p.441E.) F-171.

Keyways 10 in. long by 1 in. wide can be cut in cast iron or steel. Working length of the cutter is 9 in., and the distance from the cutter bar to the column is 18 in. The machine operates on the draw-cut principle. The table with feeding mechanism is mounted on pivots to tilt in each direction to enable taper keyseats to be cut, as well as keyseats in taper hubs. The table measures 17 in. long by 18 in. wide and has a movement of 4½ in. to handle a wide range of work.



Molding Machine, Jolt, Electric

Stobie Metallurgical Construction Co., Soho Foundry, Leeds, England. (Vol.78,p.25E.) F-40.

This electric jolt molding machine lifts the molding box, pattern and sand at a speed which is claimed to accord exactly with theoretical requirements. Jolting of the materials

on the anvil produces a shock which is truly dead without any subsequent jarring vibrations to spoil the work performed by the controlled jolt. The force of impact can be varied while the machine is running.

Molding Machine, Jar-Rollover

Pneulec, Ltd., Smethwick, England. (Vol.78,p.40E.) F-42.

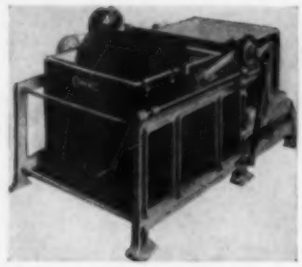
This machine has a 26x42 in. turnover plate. The bumper base stands on a sub-base with shock-absorbing material for the mechanical foundation. Pneumatic clamps hold the mold

during rolling-over, and the machine also has an automatic roll-off and a length of gravity roller conveyor. The latter is arranged in such a way that as the pattern draw cylinder reaches its lowest position, the bottom board comes into contact with the roll-off arrangement, the mold then being rolled automatically onto the conveyor without handling. Rolling over and pattern drawing are hydraulically controlled.

Plating Barrel

E. Canning & Co., Ltd., Birmingham, England. (Vol.78, p.54E.) F-54.

The Quickstone plating barrel has both the plating tank and the rinsing tank made of glazed stoneware, and the mechanical gear that operates the barrel is entirely separate. The only exposed metal surface is the actual cathode contact. The



capacity of the standard machine is for 6 gal. of articles.

Polishing Stand, Motor-Driven

General Electric Co., Ltd., Kingsway, London, W.C., England. (Vol.78,p.51E.) F-47.

This double-spindle polisher has a 5-hp., 2,900 r.p.m. motor, operating on 400/440 volts, 3-phase, 50 cycles, and of the inclosed squirrel-cage type. The rotor and the two spindles extending one from each side are

made from a solid steel forging supported by three roller bearings and one ball bearing. The two polishing wheels are mounted approximately 5 ft. apart, while the height from the floor to the center line of the shaft is 3 ft. 4 in.

Quartering and Grinding Machine, Crankpin

Craven Bros. (Manchester), Ltd., Reddish, Stockport, England. (Vol.78,p.301E.) F-138.

Worn locomotive outside crank and coupling rod pins can be trued at quarter centers. The pins may be turned and ground either right or left hand lead when assembled with the wheels and axles, and after removal of the Walschaert levers. With additional equipment the machine can be used for boring taper or parallel

holes for crankpins and for cutting threads on the ends of the pins for the retaining collars. Pins up to 9¼ in. in diameter by 15½ in. long are ground, the heads being arranged for crankpins of 8 in. minimum and 15 in. maximum

throw. The largest wheel that can be taken is 7 ft. diameter on the thread, and the wheel gage being from 1 meter to 5 ft. 6 in. The new features are, the heads are carried on vertical and horizontal slides so that the setting of any pin throw within the capacity at true quarter centers is rendered easy, and the machine can deal with right or left hand leading pins, without necessity for changing the heads. Furthermore, the motor for each spindle is carried on the rocker arm to simplify the drive. Dead stops are available for use with gage pieces for the rapid setting of the heads to the throw required. Pushbutton control for the motor is provided.

Riveting Machine, High-Speed

Benrath Machine Tools, John Dalton St., Manchester, England. (Vol.78,p.662E.)

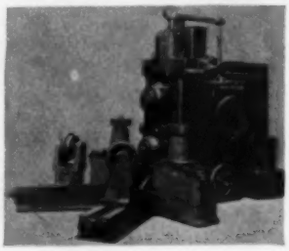
With this Titania high-speed riveting machine, the rivets, solid or hollow, are put into a container on the right-hand side. Every time the pedal is pressed down a number of rivets are lifted, and enter a chute. simultaneously one rivet is pushed on to the anvil, where it is held between two pawls

until the pedal lifts the table sufficiently for riveting to begin, when the pawls recede from the rivet head. The work to be riveted is of course put on to the rivet while it is held in the pawls. The rivet punch contacts with revolving hammers, 16 in number. By centrifugal force, they fly to the outer position, and the punch receives a high number of blows, up to 10,000 per min. Machine takes rivets with shanks up $\frac{3}{4}$ in. diameter in iron, and such a rivet can be closed completely within 2 sec. These machines are available for rivets from 1 to 10 mm. diameter.

Rolls, Tire-Fixing

B. & S. Massey, Ltd., Openshaw, Manchester, England. (Vol.78,p.616E.) F-232.

This machine is used for securing retaining rings in locomotive, carriage and wagon wheels. The pressure exerted on the tires has been increased to 25 tons, the rolling speed raised to 18 ft. per min., and the working parts have been totally inclosed. All operations, including lifting and lowering of the top roll, are controlled

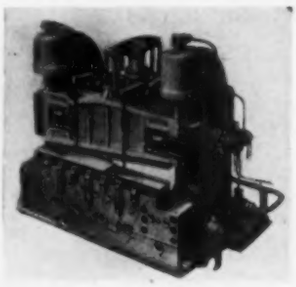


hydraulically. The larger machine will take wheels up to 7 ft. 6 in .diameter on the tread, the minimum size being 1 ft. 6 in. in diameter. Two operating rolls are used, an upper roll which closes down the lip of the tire and is keyed to a shaft provided with a worm-wheel and carried in a counterbalanced cast-iron cradle. The lower roll is driven from the upper roll shaft through steel gearing. The tire rests on the lower roll and on two supporting rollers which are adjustable along arms. The rolling process of closing the lip of the tire on the retaining ring is not only quieter than hammering, but is claimed as less likely to crack tires of high-strength steel.

Shear, Plate, Hydraulic

Sack, G.m.b.H., Dusseldorf-Rath, Germany. (Vol.77,p. 667E.) F-2.

These plate shears have several hydraulic cylinders of different diameters to be employed either separately or in various combinations. Thus two main working cylinders will give three power steps. With the smaller cylinder only, plates up to $1\frac{3}{4}$ in. in thickness may be cut. With the larger cylinder the capacity is increased to 55 mm. When the two cylinders are used in combination plates up to 3 in. thick may be cut.

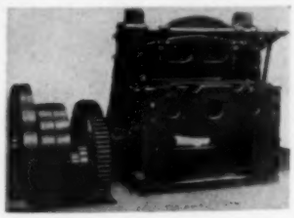


Each cylinder has independent control. The vertical down movement of the blade carrier is driven from each of the plungers through a heavy rocker arm keyed to the main shaft. Shears of this type have been made for plates up to 4,500 mm. in width. The hydraulic pressure is generated from a steam or air-driven cylinder coupled with the hydraulic cylinder. The maximum pressure applied is 1,000 metric tons.

Shear, Guillotine-Type

Lee & Crabtree, Ltd., Shipley, England. (Vol.78,p.10E.) F-37.

This heavy guillotine shear can be used for cutting up to 3 ft. wide, in $\frac{7}{16}$-in. thick alloy spring steel having a tensile strength of 50 to 55 tons. Cut-



ting blades are of alloy steel. The clutch is of the rolling-key type, controlled by a treadle. The positive hold-down also serves as a blade guide.

Slotting Machine, Automatic

Hey Engineering Co., Ltd., Coventry, England. (Vol.77, p.739E.) F22.

The machine slots the grooves in the cones on synchromesh gears. It is also suitable for other operations as a standard slotter with tilting slide, or for straight slotting. Capacity is up to 6 in. in diameter, and the stroke is 2 in. The tool-slide can be tilted 15 deg. in each direction. Both external and internal cones can be slotted. The number of indexings on the automatic indexing table can be arranged to suit requirements. For loading

and unloading the work the table is arranged to swing clear of the tool.

Slotting Machine, Vertical, Toolroom

Butler Machine Tool Co., Ltd., Halifax, England. (Vol. 78,p.612E.) F-226.

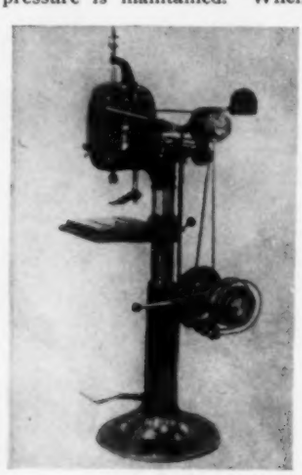
This 8 in. precision slotter has all alignments guaranteed to a maximum error of 0.0005 in. Ball thrust bearings are fitted to all feed screws. In addition to hand adjustment the circular table is fitted with an automatic circular feed by worm

and wormwheel. The table has twelve indexing positions. For taper work the upper part of the body can be tilted backwards or forwards up to 10 deg. Feed motion is of the single cam type, which enables the operator to change the feed from the front while the machine is in motion or at rest. The speed ranges from 31 to 90 cycles per min.

Tapping Machine, Vertical

Jones & Shipman, Ltd., Leicester, England. (Vol.78, p.484E.) F-185.

This machine will tap holes up to $\frac{7}{8}$ in. Whitworth, the spindle feed being 2 in. maximum. The spindle is moved downward by hand or foot control, and as the tap makes contact with the work the friction developed is sufficient to cause the forward driving clutch to drive the spindle while the necessary pressure is maintained. When

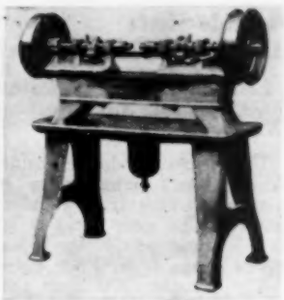


the downward pressure is released, the reverse clutch automatically engages and the tap is withdrawn. Three forward speeds are 250, 410 and 570 r.p.m. The table working surface is 10 in. by 12 in., and the table is both vertically and radially adjustable. Vertical movement is 10 in., and maximum distance from the chuck nose to table is 12 in.

Tapping Machine, Horizontal, Opposed-Spindle

John Ackworthie, Ltd., Coleshill St., Birmingham, England. (Vol.78,p.243E.) F-120.

The machine is designed for retapping of bottom brackets of cycle frames after they have



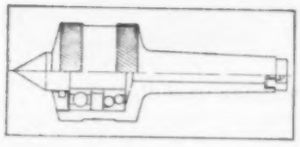
been enameled. The purpose is to remove the surplus enamel which gets into the threads of the bracket. This is tapped with a right-hand thread on one side and a left-hand thread on the other, usually 1⅛ in. by 24 threads. The taps back themselves out automatically.

Machine Accessories

Center, Ball-Bearing

Wearden & Guylee, Ltd., Bradford, England. (Vol.78, p.640E.) F-255.

This ball-bearing center has dual bearings mounted in a taper track to take both radial and thrust loads. A single ball bearing is fitted to the front of

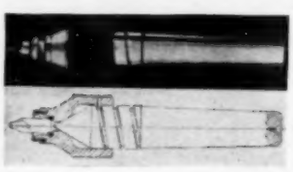


the center for the purpose of securing spindle alignment. A felt washer seals the lubrication and prevents entry of dirt. The appliance is available in 5 sizes ranging from Nos. 2 to 6 Morse taper.

Center and Drill, Lathe

Coward Bros. 8 Listerhills Road, Bradford, England. (Vol. 78,p.352E.) F-155.

The Duocentre is available in four sizes, the collet and collet nuts being interchangeable for sizes Nos. 1 and 2 and sizes Nos. 3 and 4 Morse Taper. Being both a lathe center and a center drilling device, the tool has a center made of carbon steel or high speed steel. It has a helical groove and by means of this the cap is attached and removed by a quarter turn. Operations of center drilling can be done without removal of

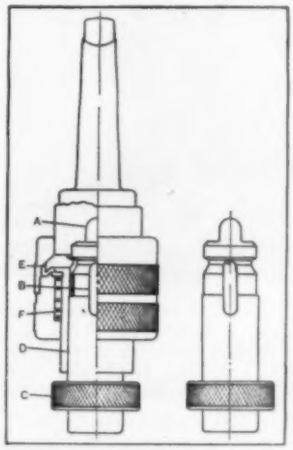


the center from the poppet head or movement of the tailstock, and this is an advantage on long chucking work were the center drill and center are used successively.

Chuck, Drill, Quick-Change

Wearden & Guylee, Ltd., Bradford, England. (Vol.78, p.610E.) F-223.

The chuck consists of a main body solid with the shank, the collet, and an outer sliding sleeve which controls the action of two sliding detents. The



last serve the purpose both of retaining the collar in position and also of releasing it. One hand only is needed for inserting and withdrawing drills while the spindle is running, Safety collar *C* is held stationary while the collet revolves when the drills are being changed. The chucks are made in three sizes, the drilling capacities being from 0 to ½ in., from 0 to 1¼ in., and from 0 to 2 in. respectively.

Dieheads, Self-Opening, "Namco"

George H. Alexander Machinery, Ltd., Coleshill St., Birmingham, England. (Vol.78, p.655E.) F-263.

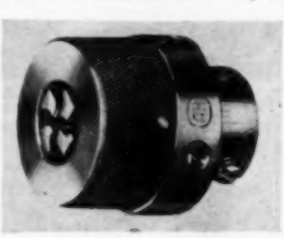
Namco self-opening dieheads are available in both stationary and revolving types, the latter being shown. Quickly removable circular chasers are used in both types. The stationary model is made in seven sizes from ⅜ to 3½ in. capacity, while the revolving type is made in five sizes from ⅝ to 1⅝ in. capacity. Each chaser unit consists of the chaser proper, the

chaser block, the connecting bushing and a setscrew. Each chaser has a series of lapped grooves which form the thread without lead. The latter is obtained by mounting the chasers on the hardened steel chaser blocks which have their faces ground to the helix angle required.

Dieheads, Solid-Adjustable

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.302E.)

Two sizes, ¼ in., and ½ in., are offered in the solid-adjustable dieheads for use on automatic screw machines having reverse to the spindle. The dies fit in slots in the body of

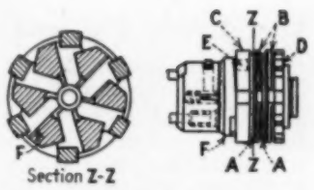


the diehead and are held by the outer sleeve, which also provides adjustment by means of scrolls. The front threads only of each die do the cutting, the remaining threads being above the center and acting as a guide nut.

Hone, Cylinder, Semi-Automatic

George H. Alexander Machinery, Ltd., Coleshill Street, Birmingham, England. (Vol.78, p.162E.) F-94.

Increased accuracy, longer stone life and greater convenience in operation are claimed for this semi-automatic cylinder



hone. A preloaded spring expansion unit is applied. If the total load were 100 lb., the preloading device would be set to take the load off the stones when the pressure had fallen to about 90 lb., and this condition makes for increased life of the stones and more accurate work. Tangential slots receive stoneholders with a flat face *F*. The spring unit consists of a series of spring steel washers alternately plain and ribbed radially. Four of these washers are confined between the flange *C* on a screwed sleeve and an adjusting nut *D* by means of which the preloading is effected. Additional load for grinding is applied through the medium of tool steel pins *E*. At the outer ends, the pins bear on a hardened pressure plate *F*. After the stones are expanded into contact with the cylinder wall, additional compression is placed on the spring element, the amount being set to graduations. On starting up, grinding will proceed automatically with only a slight diminution of pressure until the finished size is reached.

Vise Mounting Device, Universal

Charles Winn & Co., Ltd., Granville St., Birmingham, England. (Vol.78,p.51E.) F-48.

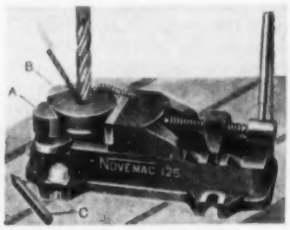
A combination swiveling and tilting base or mounting for taking a vise or workholder is shown tilted to an angular position. The vise consists of two members; that is, a fixed

member *A* bolted to the bench and hinged to a tilting base. The central bolt *B* acts as a clamping medium. The tilting base is constructed with an upper part *C*, whereby the vise may be swiveled to any angle and locked by a central cone-grip clamp operated by a lever.

Vise, Machine, Universal

E. L. Youngleson, Ltd., 67 Chancery Lane, London, W. C., England. (Vol.78,p.334E.) F-150.

In the Novemac vise the grip is split into three surfaces; the jaw arrangement consists of two jaw posts each having finely serrated or plain gripping flats, and a circular shank that

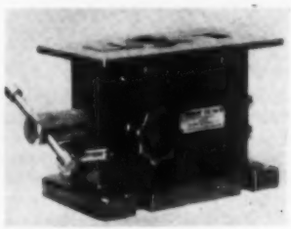


fits into the vise body. Each post may be turned as required, but is prevented from rising by cross pins which fit into annular grooves in the shank. Each post has a set of three gripping flats which vary in their distance from the center. Flat and vertical work may be held. The moveable jaw face is 5 in. wide by 1 1/16 in. deep, the overall height 4 in., the overall length 14 3/4 in.; capacity, parallel 6 1/2 in., round, 6 1/2 in., and weight, 39 lb.

Vise, Machine and Bench

E. L. Youngleson, Ltd., 67 Chancery Lane, London, W.C., England. (Vol.78,p.523E.) F-193.

The steel body has a top with a machined work-supporting and gaging face. Jaws operate inside the work-supporting face. The front jaw has no movement, the vise action being effected by the movement of the rear jaw through the screw and small handwheel. In addition, to the opening and closing movement, the jaws have simultaneous vertical adjustment by the knob at the side. Two sizes are built. The larger has a supporting face 9 1/4 in. by 5 1/2 in.; jaw opening 3 1/4 in.; jaw lift, 2 in., and width of jaws, 1 1/2 in. The smaller vise has a supporting face 4 1/2 by 3 in.; jaw opening, 1 1/2 in.; jaw lift, 1/16 in., and width of jaws, 3/4 in.

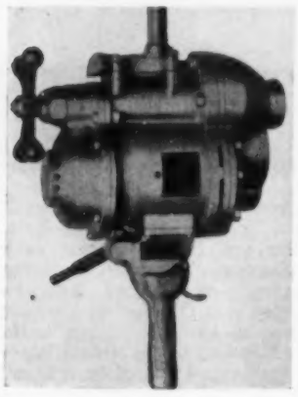


Portable Tools

Drill, Electric, 1-In.

Joseph Lucas, Ltd., Great King St., Birmingham, England. (Vol.78,p.41E.) F-45.

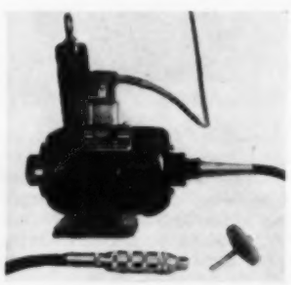
Offered for heavy duty work, this tool will drill up to 1 1/4 in. holes in steel, ream to 1 1/8 in. in steel. No-load speed is 290 r.p.m. Feed screw travel is 4 in., overall length is 13 in., and the net weight is 35 lb. The universal motor has the armature and intermediate gear shafts carried on ball bearings, while the main spindle runs in combination ball and phosphor-bronze bearings. A drill stand is available. The travel is 4 in., increased to 8 in. by using the feed screw of the drill.



Flexible Shaft Equipment

S. Wolf & Co. Ltd., 115 Southwark St., London, S.E., England. (Vol.78,p.68E.) F-57.

Introduced are: an electric blower weighing 11 lb., a light flexible shaft grinder for grinding dies and molds, a flexible shaft equipment for filing and grinding, and a 6-in. ball-bearing electric bench grinder. The

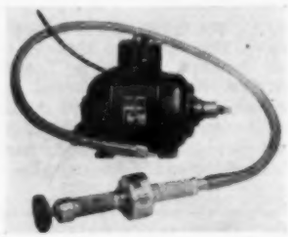


flexible-shaft die grinder has a universal motor and fan ventilation. The flexible-shaft filing and grinding equipment has a 1-hp. universal motor and incorporates a speed reducer to give 1,000 r.p.m. for filing, or when coupled direct a speed of 11,000 r.p.m. for grinding. The bench grinder has a 1/3-hp. motor and carries a 6x3/4-in. grinding wheel at each end.

Flexible-Shaft Handpiece, Geared

Loranco, Ltd., 40, Sydenham Road, London, S.E., England. (Vol.78,p.103E.) F-74.

This geared handpiece enables flexible shaft grinding to be done by driving from standard motors. The gear ratio is 4.5 to 1. Consequently, the wheel speeds range from 4,500 r.p.m. to 13,500 r.p.m. The input side, or flexible shaft connection is



tapped and arranged to take simple adapters. The output side is threaded and tapered to take wheels with holes, or it may be fitted with an extension piece which holds wheels on arbors by means of a collet chuck. Recessed grinding wheels up to 2 3/4 in. in diameter by 3/4 in. wide may be employed at about 13,000 r.p.m.

Grinder, Flexible-Shaft

F. Gilman, (B.S.T.), Ltd., 221 High St., Smethwick, Staffs, England. (Vol.78,p.52E.) F-50.

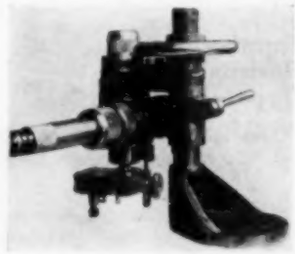
The motor is strapped on the back of the operator so that his hands are free to operate the lighter handpiece. Weight of the complete outfit is less than

26 lb. The working heads include a disk cutter head with cutters, 4- or 5-in. ring wheels, 7-in. sanding head and wire brushes, which all rotate at 2,800 r.p.m.

Machining Head, Portable

Flextol Engineering Co., Ltd., 18 Dartmouth St., Westminster, S.W., England. (Vol.78,p.40E.) F-43.

This machining head is driven through a flexible shaft from a small electric motor. The head is capable of facing, boring, or drilling, and has a round pillar with a base and elongated hole for fixing to the work. The cutter spindle and driving mechanism are mounted on the pillar and may be swivelled 360 deg. Vertical adjustment is obtained through a hand-wheel and screw. Facing is performed with a small lathe-type tool mounted in a holder which is adjustable on an inner slide for dealing with diameters



from 6 to 2 1/2 in. The inner slide is automatically fed inwards across the face at the rate of 0.003 in. per rev. Between the motor and the machining head is introduced a three-speed gearbox. The final drive from the flexible shaft to the cutter spindle is through worm gearing.

For boring, the cross feed device is dispensed with, a cranked tool being fed down by the handwheel and screw on the main pillar. The tool slide is fitted into the main cutter spindle by a No. 2 Morse taper, so that when the slide is removed the taper may be utilized for taking drills up to 1 in. in diameter. As for boring the drill is fed down by the handwheel.

Sander and Polisher

Grimston Electric Tools, Ltd., 138 Lever St., London, E.C., England. (Vol.78,p.288E.) F-137.

The three-speed sander and polisher is built in two sizes, namely a tool with 7 in. disk and a 9 in. machine. The tool may be used with attachments or for driving a flexible shaft at

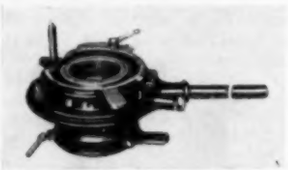
three points, each point giving a different speed. The first point gives a speed of 1,000 r.p.m.; the second a speed of 3,000 r.p.m., and the third a speed of 10,000 r.p.m. Thus, small drills, rubbing down and polishing pads, and rough grinding wheels can be taken. A step-up speed handpiece can be fitted.

Small Tools

Die-Stock, Chaser-Type

Easterbrook, Allcard & Co., Ltd., Sheffield, England. (Vol. 78,p.573E.) F-203.

This chaser die stock of the ratchet, receder type will thread pipe from 1 to 2 in. in diameter in the small size, and



from 2¼ in. to 4 in. in the large size. By means of a knurled screw and ring the stock may be adjusted to cut either parallel or taper threads.

Hacksaw, Magazine-Type

James Neill & Co., Ltd., Sheffield, England. (Vol70,p. 483E.) F-184.

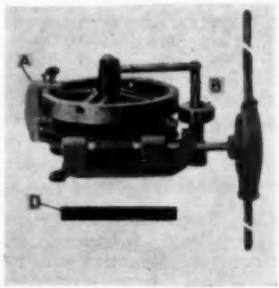
This hacksaw frame is of tubular design and the bow forms a magazine for five of the firm's "Eclipse Flex" blades,

in a variety to suit the work. The blades are of the 10 in. size.

Tube Bender

Skylux, Ltd., 22, Great St. Andrew St., London, W.C., England. (Vol.77,p.739E.)

This hand-operated device will deal with tubes up to 1¼ in. internal diameter, angles up to 1½ x 1½ x 8 in. In making the first bend, the adjustable stop *A* is set next to the roller *B*. The shield *D* is interposed between the work and the roller *B* and transmits pressure to the work. The shield presses the material into the desired position and rolls through with it. Bars inserted in the top plate are used for clamping the work down to prevent buckling.

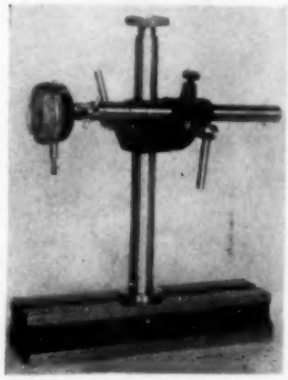


Gaging and Testing Equipment

Dial Test Indicator

Buck & Hickman, Ltd., Whitechapel, E., England. (Vol.78,p.641E.) F-257.

One of these dial indicators has a dial graduated to 0.0001 in. and a spindle movement of 0.3 in., whereas the other for work of higher accuracy has a dial graduated to 0.0001 in., and has jewelled bearings, the

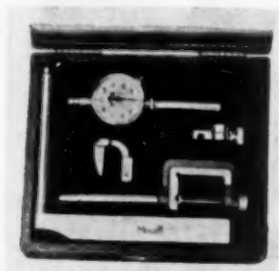


movement of the spindle being 0.02 in. A much larger upright and dial holding rod give greater rigidity. Bases of both indicators are 10 in. in length by 3 in. wide. Straight and angular stops are available.

Dial Test Indicator, Universal

J. E. Baty & Co., 39 Victoria St., Westminster, S.W., England. (Vol.78,p.350E.) F-153.

The Mercer universal dial test indicator consists of a dial

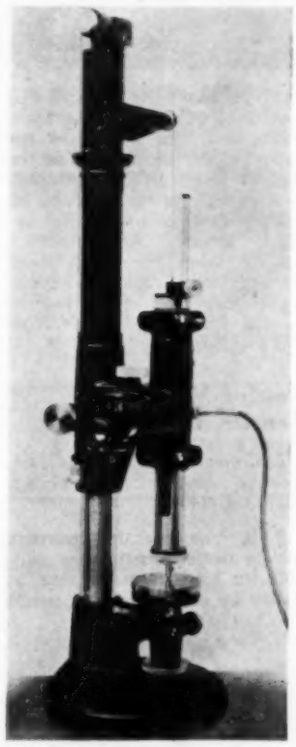


gage and holding rod, swivel clamp for attaching the rod to the support, ring-angle contact piece, general-purpose support, and rectangular bar support for lathe tool holder. The dial gage readings range from 0 to 100.

Comparator, Vertical, Vise

Alfred Herbert, Ltd., Coventry, England. (Vol.78,p.226E.) F-115.

Direct precision measuring of any part without the use of slip gages can be done. The instrument is set to zero when the measuring plunger makes contact with the measuring table after which work of any

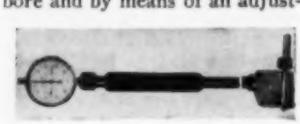


size up to 4 in. may be inserted and direct reading obtained down to increments of 0.00001 in. Measuring pressure is normally 8 oz. Inside the measuring column and placed in the exact axis of motion is an optical scale, and by means of a spiral microscope the position is read.

Gage, Cylinder-Bore

J. Leete & Co., Percy St., Coventry, England. (Vol.77,p. 755E.) F-26.

The gage can be swiveled 30 deg. on each side of the vertical and yet give correct readings. In use, the cross-head, which is radiused, is set in the cylinder bore and by means of an adjust-

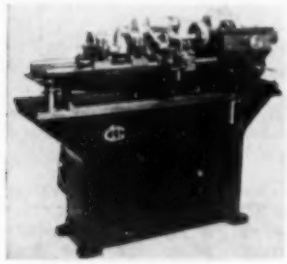


ing device at the back, the dial is turned so as to bring the pointer approximately vertical. The instrument is then swung in the bore until the maximum reading is shown. Gaging is effected by means of extension pieces ground spherically to suit the smallest bore to be tested by each piece. Three extension pieces enable any cylinder between 2 and 6 in. bore to be measured.

Balancing Machine, Dynamic

British Balancing Co., North London Ironworks, Wenlock Road, London, E.C., England. (Vol.78,p.525E.) F-195.

Designed by Professor J. J. Guest, this balancing machine wili swing 8 in. and lengths from end of bed to headstock from 27 to 50 in., according to the size of the machine. It incorporates the principle of obtaining dynamic balance in bodies by

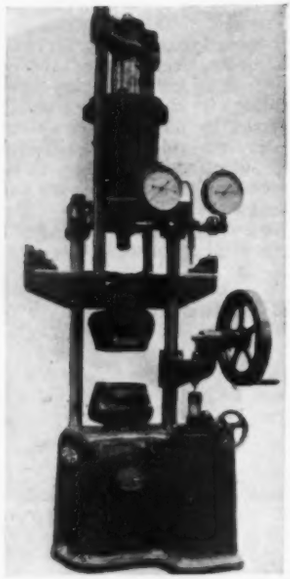


aritficial mechanical adjustments of balance weights, the necessary correction shown by the adjustment being transferred to the work. Only two adjustments are necessary to secure complete balance. The fundamental factors or units comprise a pivoted oscillating or vibrating frame on which the work is mounted, together with a balancing head, members of which are coupled to and rotate with the work. The unbalance in the work causes vibration in the oscillating frame. The rotating members are a pair of arms each carrying an adjustable compensating weight. The distance between the arms is proportional to the out-of-balance of the head. The turning adjustment of the balancing arms indicates the angular position or phase of the correction.

Testing Machine, Tensile

Craven Bros., (Manchester), Ltd., Reddish, near Stockport, England. (Vol.78,p.10E.) F-36.

This vertical testing machine for making tensile and transverse tests on cast-iron applies a load by means of a vertical ram working in the cylinder above the machine, and supplied with oil from a hand-driven pump. The load is measured by two pressure gages connected with the machine cylinder, one

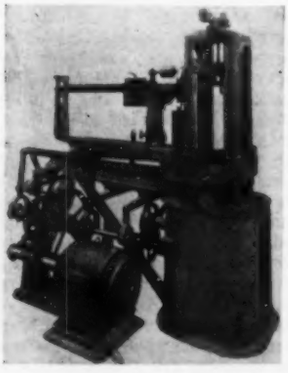


gage being for loads up to the full capacity of 30 tons, and the other for loads up to 15,000 lb.

Testing Machine, Universal, 30,000-lb.

E. G. Herbert, Ltd., Levenshulme, Manchester, England. (Vol.78,p.640E.) F-256.

This Olsen universal testing machine of 30,000 lb. capacity applies the strain mechanically through either three or four screws. The whole straining system is independent of the weighing unit. The crosshead



is of the open-front design to permit easy adjustment of test samples. Direction of travel of the crosshead is controlled either by reversing the motor or by a lever actuating a reversing gear. With a constant-speed motor four speeds are available which cover all general requirements for testing.

Checking Machine, Gear

G. E. Marbaix, Ltd., Vincent Square, London, S.W., England. (Vol.78,p.664E.) F-278B.

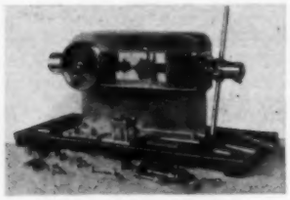
The spiral-gear lead-checking machine has been described (Vol.75,, page 395).

The involute checking machine is shown on page 100.

Testing Machine, Mechanical

Griffin & Tatlock, Ltd., Kemble St., Kingsway, W.C., England. (Vol.78,p.119E.) F-82.

The Griffin-Gale testing machine will carry out tension, compression, indentation or bending tests on metals. The machine body is of bridge construction with an opening in the top to insert and remove test pieces. The right bearing box carries the rectangular-section,

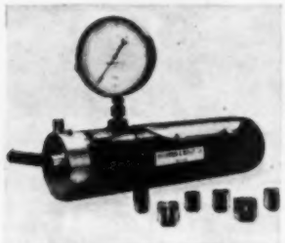


draw-tension bar which is moved in either direction by a screw and pilot wheel. In the opposite bearing box slides the resistance-tension bar, attached to a helical spring which by its compression balances the applied stress. A pneumatic cushion takes the recoil when the specimen breaks. The dial is calibrated by direct loading on the spring and reads from 600 to 1,200 lb.

Testing Machine, Tensile, Portable

Greenwood & Batley, Ltd., Leeds, England. (Vol.78,p. 302E.) F-140.

This hand-operated portable tensile testing machine is suitable for loads up to 20 tons, as shown by gage. The ram stroke



is 3 in. and the weight is 160 lb. The pump is self-contained with the body, which carries the straining heads.

Testing Machine, Oil, Film and Friction

British Timken, Ltd., Aston, Birmingham, England. (Vol. 78,p.493E.) F-186.

Information relating to the load-carrying capacity of lubricants can be found on the testing machine illustrated. It also can be used for measuring friction and calculating the wear-resisting properties of materials. The main units are the lubricant container and return pump, the lever system, and the ar-

rangements for direct or belt drive. The upper lever carrying the test block acts as the load lever, and is pivoted on a knife-edge mounted in the lower lever. The latter, also pivoted on a knife-edge, is provided with a scale and a sliding weight for obtaining measurements. A tapered mandrel carries the testing cup, and a notch in the adapter carried on the load lever is provided to take the test piece. Friction is measured between cup and test piece, and lubricant from the container flows between the two contacting surfaces.

Hardness Tester, Rockwell

Georg Reicherter, Esslingen, Germany. (Vol.78,p.319E.)

The Briro hardness tester obviates any difficulties experienced in connection with the conventional work - clamping rest, in making Rockwell tests, particularly when testing irregular and overhanging pieces. The test piece is forced against an upper abutment under a constant pressure which exceeds the actual test load, however, without depending on it. The upper abutment consists of a thin-walled bushing inclosing the diamond and protecting it from shocks and stresses. The hollow screw-spindle, adjusted for height of work by the pilot wheel, receives in its bore a shaft which carries an exchangeable workrest or table at its upper end. The machine may be used to make internal or external measurements.

Hardness Tester, Portable

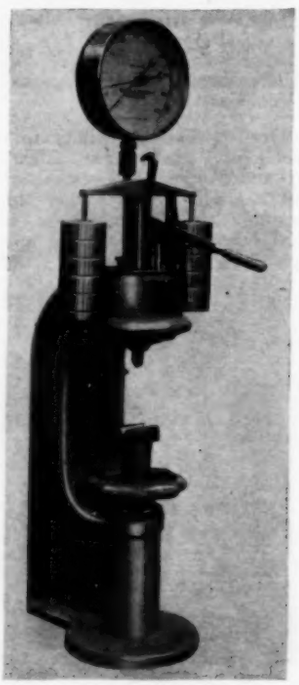
La Précision Mecanique, 11, Rue Vergniaud, Paris, France. (Vol.78,p.104E.) F-77.

This Microbilleur hardness tester is equipped either with a ball of small diameter, or with a diamond, and will measure the hardness of materials of fine gage, that is, laminations and wires, the range being from 25 to 980 Brinell. The action of the ball is caused by the free fall of a ram. Rapidity of operation is secured. Because the appliance weighs 11 lb. it is readily portable.

Hardness Tester, Brinell

E. G. Herbert, Ltd., Levenshulme, Manchester, England. (Vol.77,p.725E.) F-14.

This Olsen hydraulic Brinell hardness tester is being built under license. The load is applied hydraulically by a pump actuated by the lever at the top of the machine and this pressure is indicated on the gage at all times. It can be checked automatically at any load up to 3,000 kg. Weights are provided for pressures cor-

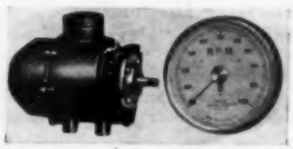


responding to 500, 1,000, 1,500, 2,000, 2,500 and 3,000 kg. For holding small round specimens a separate V-block for use on top of the flat anvil is supplied. Distance from the frame to the center of the ball is 4 in. and the vertical clearance from the anvil to the ball is 7¼ in.

Tachometers for Machine Tools

Record Electrical Co., Ltd., Broadheath, near Manchester, England. (Vol.78,p.455E.) F-175.

The tachometer is an electrical device consisting of a dynamo connected to an indicator which is essentially a voltmeter with a scale marked



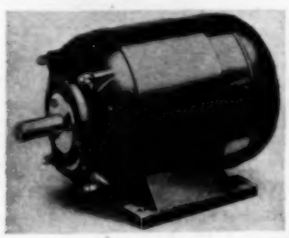
in r.p.m., or ft. per min. Either regular or watertight construction can be supplied for use on machine tools and other equipment. The machine is standardized to generate 100 volts at 2,000 r.p.m. The magnetic field being constant, the voltage is proportional to the armature speed and thus to the speed of the machine with which it is connected mechanically. The tachometer can be run in either direction and is thus suitable for use with a reversing mechanism.

Electrical Equipment

Motors, Fractional-Hp., Ball-Bearing

British Thomson - Houston Co., Ltd., Rugby, England. (Vol.78,p.430E.) F-168.

Both a.c. and d.c. fractional-horsepower motors are being offered. Up to ¾ hp. the machines have feet cast solid with the end shield, and above ¾ hp., they have a pressed steel or



cast base. Motors can be supplied with feet or base and spigoted end-shield to provide means for mounting on apparatus directly. Without the feet or base, but with the spigoted end-shield the motor can be built in or carried on the machine. Sizes up to 1 hp. are built.

Motors, Fractional-Hp.

Croyden Engineering Co., Ltd., Gloucester Road, Croyden, England. (Vol.78,p.541E.)

These fractional-horsepower motors, suitable for d.c. or one-, two- and three-phase a.c. circuits, can be supplied with a worm gear reduction box. Com-

mutator machines are available in ten frames, ranging from 1/100 hp., at 1,500 r.p.m., to 2½ hp. at 4,500 r.p.m. Squirrel-cage induction types are built in seven frames, ranging from 1/40 hp. at 1,440 r.p.m. single-phase, to 2½ hp. at 2,880 r.p.m. three phase.

Motors, Fractional-Hp.

English Electric Co., Ltd., Stafford, England. (Vol.78,p. 442E.) F-172.

Included in a line of fractional-horsepower motors for a.c. circuits, is a "Capductiön" type and also split-phase models, both being available in four sizes from ⅛ to ½ hp., for

use on any voltage from 200 to 250 at 50 cycles. The motors are of the spingle-phase, squirrel-cage, self-starting type. Both types can be supplied with a special resilient base.

Motor, Reversing, Special

Brook Motors, Ltd., Huddersfield, England. (Vol.78,p.594E.) F-212.

This special motor is designed for operating drilling machines or wherever rapid and frequent reverse is necessary on load. It has a specially strengthened yoke and oversize shaft, bear-

ings and lubricators. It is capable of 30 reversals per min. on load and is machine-tool rated. It is designed to start with a cushioned effect and yet can reverse from 1,500 r.p.m. in one direction to 1,500 r.p.m. in the other direction within ¾ sec.

Control Devices, Motor

British Thomson - Houston Co. Ltd., Rugby, England. (Vol.78,p.210E.) F-112.

Automatic pressure switches and float switches have been designed. The former are of diaphragm pattern, designed to operate on changes of pressure of air or any liquid which will not affect rubber or steel parts. The switches are of the double-pole type with silver contacts. They can be used for direct starting of small motors or as pilot devices for operating contactor starters of large motors.

Relay, Reverse-Rotation

British Thomson - Houston Co., Ltd., Rugby, England. (Vol.78,p.557E.) F-200.

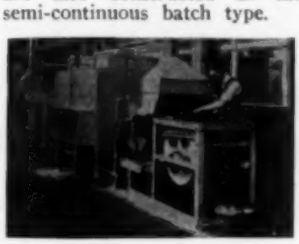
In this reverse rotation relay the motor is started by a contactor in the usual way. When quick stopping is desired, a plugging contactor is energized which reverses the phases of the motor, thus quickly stopping it. The device ensures that the motor does not run in the reverse direction.

Furnaces and Equipment

Furnace, Bright-Annealing

Birmingham Electric Furnaces, Ltd., Erdington, Birmingham, England. (Vol.78,p.69E.)

The Brytreat continuous-belt, conveyor-type, bright annealing furnace is used for processes in which prevention of oxidation of the work is of importance, and is also applied to bright copper brazing, bright silver soldering and other work in which the surfaces to be joined must be kept clean during their passage through the furnace. A heating chamber and a water-jacketed cooling chamber are used, the two being kept full of a gas or gas mixture having a neutral or slightly reducing action on the work. The gases are generated by separate equipment. Furnaces employing essentially the same principle are also constructed in the semi-continuous batch type.



Furnace, Gas, Hardening

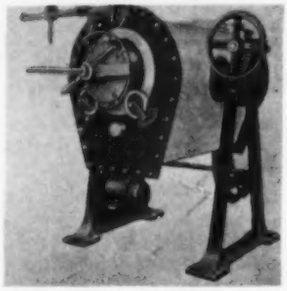
Lucas Furnaces, Ltd., Nechells, Birmingham, England. (Vol.78,p.646E.) F-260-B.

This furnace for hardening high-speed steel without surface scaling embodies the principle of radiated heat transmission, without direct contact with the flame or gases of combustion. The muffle is built of fused alumina or silicon carbide and the recuperators are of nickel-chrome alloy. The furnace has separately operated chambers with fan blast.

Furnace, Carburizing, Rotary

Kasenit, Ltd., Henry St., London Bridge, London, S.E., England. (Vol.78,p.647E.) F-260-C.

The D-shaped body provides a separate combustion chamber for the burners, and local heating of the retort is prevented.

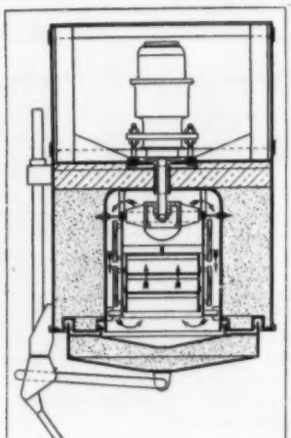


Pyrometric equipment is included. Both the speed of rotation of the furnace and the rate of feed of carburizing compound into the retort are adjustable.

Furnace, Pot, Electric

Brayshaw Furnaces & Tools, Ltd., Belle Vue, Manchester, England. (Vol.78,p.646E.)

Air circulation at high-speed is provided by a unidirectional Gill screw fan, the air being heated by passing over removable nichrome elements and drawn down through the work basket. The fan is coupled di-

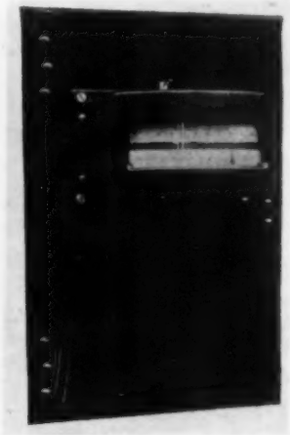


rectly to a hig-speed electric motor and may be mounted either in the hearth or in the lid.

Temperature Controllers, Automatic

Foster Instrument Co., Letchworth, Herts, England. (Vol. 77,p.667E.) F-3.

Automatic temperature controllers for use with oil, gas or electrically heated furnaces are offered. A panel contains the necessary motor drive



whereby the depression mechanism to select the contacts in the indicator is operated. It also contains a transformer so that the instrument can be operated directly from the electric mains. In addition to actuating the control mechanism, the indicator also serves to show the actual temperature of the furnace.

Temperature Indicator, Projected-Scale

Foster Instrument Co., Letchworth, England. (Vol.78, p.69E.) F-59.

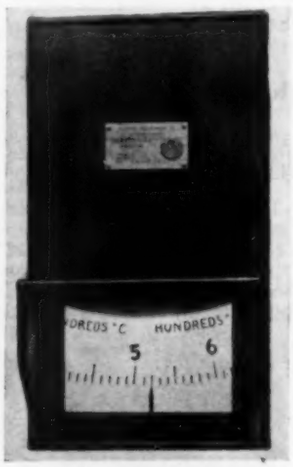
For use as a temperature indicator where there is a bad or confusing light, this projector scale indicator consists of a "Resilia" vibration and shock proof, double-pivoted galvanometer having a minute temperature scale. By means of an optical and illuminating system, a greatly enlarged image of a small section of the scale, together with a view of the pointer, is thrown on a ground glass screen, mounted in front of the indicator. The apparatus is self-contained in a metal case and highly accurate readings can be made at a considerable distance.

Furnace Inspection Windows, "Pyroptic"

Liptak Furnace Arches, Ltd., 59, Palace, St., Victoria St., S.W., England. (Vol.78,p.9E.)

The "Pyroptic" inspection window is fitted permanently in any part of the settings and consists of a metal frame work carrying a comparatively large

area of tinted glass through which a complete view of the interior of the furnace is obtained in comfort. It is claimed that windows can be exposed without injury for long periods to a temperature as high as 2,800 deg. F.



part. The latter consists of a ring with a series of equally spaced radial slots. Working in the slots are a set of flat steel plungers which are retained freely in circular formation by a pair of rings fitting into grooves in the plungers. The outer ends of the plungers are formed to engage with the V-shaped cam surfaces on the stationary ring. The eccentrically mounted ball bearing rotates in contact with the inner ends of the plungers, so that the eccentric movement causes the plungers to slide in and out progressively.

Speed Reducers, Motorized, Low-Speed

British Thomson-Houston Co., Ltd., Rugby, England, and Metropolitan-Vickers Electric Co., Ltd., Trafford Park, England. (Vol.78,p.88E.) F-67.

The motor is carried on the gearbox and not the gearbox on the motor. The heavy low-speed shaft will carry a pulley, chain or gear wheel without the

use of a third bearing. All gears run in oil and have single-helical teeth for quiet running. Anti-friction bearings are used throughout. Motors may be had for d.c. or a.c.

Speed Reducers, Motorized, Fractional-Hp.

British Thomson-Houston Co., Ltd., Rugby, England. (Vol.78,p.178E.) F-97.

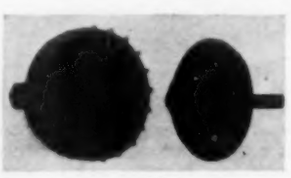
The low-speed worm-geared motor units are made in sizes from ½ to 1 hp. Initial speed of each motor is 1,425 r.p.m., but the final speed can be as low as 50 r.p.m. Motors may be split-phase or repulsion-star induction type or for direct current. The worm shaft is coupled directly to the rotor.

Transmission Equipment

Speed Reducer, "Heliocentric"

Sanderson Brothers & Newbould, Ltd., Attercliffe Works, Sheffield, England. (Vol.78, p.88E.) F-66.

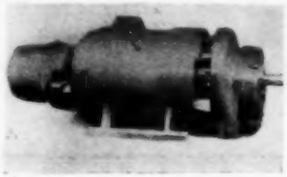
This "Heliocentric" speed reducer is designed to take high speed driving motors and is available in ratios from 16 to 1 upward. The outer casing is stationary and is bored to take a ring which is fixed by means of a key. On the internal diameter of the ring are cut, around the entire circumference, a series of ratchet V-formed teeth which are actually cam surfaces controlling the movement of the rotating members. The right-hand view shows the slow-speed driven part with the large shaft, while the left-hand view shows the high-speed driver with the small shaft. The latter is mounted eccentrically in a ball bearing container in the flange, which incloses the face of the driven



Speed Reducers, Motorized, Universal

Crofts (Engineers), Ltd., Thorbury, Bradford, England. (Vol.78,p.334E.) F-149.

The universal-type gear motor consists of a self-contained gear unit mounted on the end of a standard motor with feet. The gear unit can be fitted in

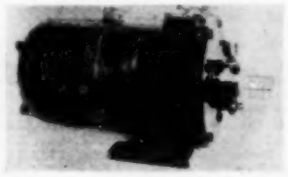


any position radially on the motor end frame, thus providing for any mounting position, horizontally or vertically. The gears have been standardized to transmit up to 30 hp.

Speed Reducer, Motorized

Moss Gear Co., Ltd., Tyburn, Birmingham, England. (Vol. 78,p.573E.) 202.

The combined motor and planetary speed reducer shown is suitable for transmitting from ½ to 1 hp. at speeds from 1,800 r.p.m. downwards, the reductions being from 2 to 1 up

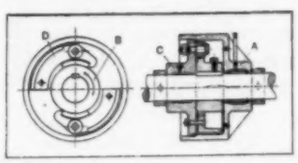


to 200 to 1. Any motor may be used, but a special flange mounting is required for bolting to the speed transformer case.

Brake, Automatic

Crofts (Engineers), Ltd., Bradford, England. (Vol.78 p.287E.) F-135.

This Jones automatic brake prevents reverse motion but does not transmit power. It has three main parts, a shell *A*, a wedge block *B* and a flanged hub *C* on which the brake shoes are pivoted. The complete brake is secured where desired on the primary shaft. To prevent rotation the shell with suitable bushing is secured by bolts, band brake or other means to the machine, the wedge lock or one-way driving member being keyed to the primary shaft. This member, when running in a normal direction engages with



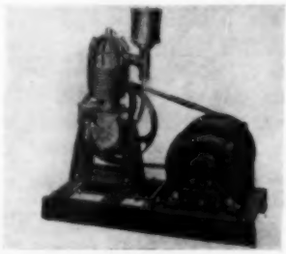
lugs on the brake shoes *D*, thus driving the flanged hub with the shaft. Should the primary shaft stop or reverse direction, the one-way member slides on the curved path of the brake shoes, forcing these outwards with increasing pressure on the internal surface of the shell and thus arresting reverse rotation without shock. Range of shaft sizes, 1 to 6 in.

Miscellaneous Equipment

Air Compressor, Vertical

Aerostyle, Ltd., St. John St., Clerkenwell, E.C., England. (Vol.78,p.470E.) F-181.

Among air compressors for paint spraying is the model shown which is designed for speeds up to 1,000 r.p.m., and for pressures up to 100 lb. per sq.in. When running at 900

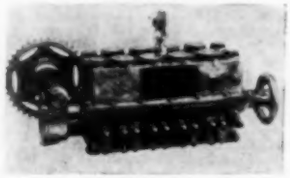


r.p.m., the machine has a piston displacement of 7 cu.ft. of free air per min. for a consumption of 1 hp., when working to a pressure of 60 lb. per sq.in.

Lubricator, Forced-Feed

C. C. Wakefield & Co., Ltd., 30 Cheapside, London, E.C., England. (Vol.77,p.685E.) F-8.

Designed for machine tool use, lubricators having 40 feeds, 20 on each side, have been developed. In the model shown drive is by means of chain sprockets and 65 to 1 worm reduction gears. This type lubri-

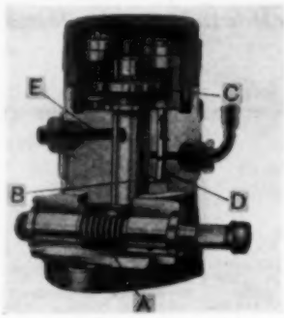


cator is available with varying numbers of feeds up to 48. Lubricators are tested to pressures of 1,000 lb. to 2,000 lb. per sq.in. Each feed is adjustable within close limits.

Lubricators, Forced-Feed

Bosch, Ltd., Larden Road, London, W., England. (Vol.78, p.209E.) F-110.

These circular forced-feed lubricators may have six outlets set around the circumference. At each outlet the pump is capable of delivering 72 cu.cm. per hr. A cam wheel

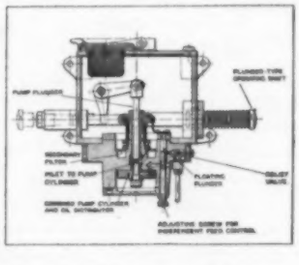


converts rotary motion to an up-and-down motion of the working pistons, without employment of valves. Each feed point is connected by piping to a separate pump unit which has an adjusting screw controlling the output from 0 to 0.06 cu.cm. per stroke. Three models are available: For rotary drive by gearing, chain or direct-coupled by driving claw, for which two flats are provided on the driving shaft.

Lubricator, Forced-Feed

D. Brown & Sons, Ltd., Huddersfield, England. (Vol.78, p.525E.) F-194.

This multiple-delivery, forced-feed lubricator can be operated by cams or pivoted lever. The mechanism is totally inclosed. The plunger-type operating shaft actuates a bell-crank lever to operate the plunger of a reciprocating pump, and, by ratchet motion, a submerged distributor. A radial passage

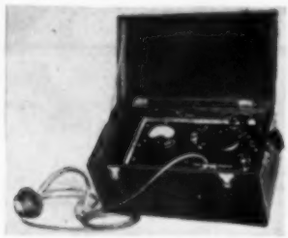


in the distributor provides communication between the pump cylinder and a series of passages positioned radially and leading to the feed pipes. As a regulating device, each feed pipe has a small vertical plunger with controllable lift and a horizontally placed non-return valve. Four sizes are built with capacities from 4 pints to 18 pints, the number of feeds ranging from 6 to 24.

Noise-Measuring Apparatus, Portable

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, England. (Vol.78, p.104E.) F-76.

The apparatus enables aural comparison of a complex noise to be made with a pure reference tone of fixed frequency and adjustable amplitude. The apparatus consists of a valve oscillator, a calibrated attenuator and a telephone earpiece. The frequency of the oscillator



is 800 cycles per sec. The scale employed for loudness is in decibels. The outfit can be adjusted to give a range of voltages.

Noise Meter, Standard

Standard Telephone & Cables, Ltd., Connaught House, Aldwych, W.C., England. (Vol. 78,p.189E.) F-99.

Noise measurements can be made with this meter which makes use of the masking method of measurement, in which the observer listens simultaneously to the noise under observation and to a standard reference tone in a head receiver. The reference tone is

generated in the set and the measurement consists of adjusting its intensity by means of a calibrated volume control until it is just not masked by the noise.

Pumps, Coolant

Modern Machine Tools, Ltd., Coventry, England, (Vol.78, p.377E.) F-160.

A centrifugal pump not shown has a horizontal spindle and is self-priming. Pipe connections are ¾ in. gas. Delivery is 5 gal. per min. at 250 r.p.m., 10 gal. at 300 r.p.m., 18 gal. at 400 r.p.m.

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THE ROUND TABLE

Tooling Up

"I hate to say it, Al, but as a stockholder, I think we ought to be looking for a new manager for this compressor plant of ours," said Ed with a grin, as he met Al in the office.

"What's on your mind now, Ed? I may even agree with you, for a change."

"I've been looking around the place for jigs and fixtures for cutting costs on these pumps. I always thought you were all for fixtures on work of this kind."

"So I am, Ed, but only when I think they will not only pay for themselves, but really save money."

"But I found several fixtures, Al, for flange bolt holes, and some of the simpler operations. Why not for the operations that will really save money,"

"That's a fair question, Ed, and it's largely a matter of judgment in any case. I had jigs made for flange bolt holes more to secure interchangeability than to save time. Its a simple job, but we do want all our flanges to be alike, within reasonable tolerances."

"Isn't it equally important to have the rotors interchange when you have to send a replacement, Al?"

"Not quite the same, Ed, though a lot of people overlook the difference. Unless the motor needs replacing while it is still quite new, which isn't likely, both the motor and the case have worn to some extent. If you want a good job they've got to be fitted anyhow."

"But wouldn't fixtures save money in building the compressors, Al?"

"They probably would, Ed. But don't forget two important points; they would cost a lot of money and would only save direct labor. If we built enough pumps before changing the model, fixtures would pay. But they would tie up capital which isn't any too plentiful as it is, and it would take too long to save the cost in this case."

"But it would save on the payroll, Al. And that comes every week."

"With the number we make the saving in the payroll wouldn't pay the interest on the cost of the fixtures, Ed. I've figured it out. A lot of people forget that in some cases labor is the cheaper outlay instead of fixtures."

"Isn't that all theory, Al? Why do some shops spend so much for fixtures?"

"Usually because it pays, but in some cases it doesn't. I knew a man who used to build planers. He pulled out of the old concern and designed a new planer that was O.K. Then he made jigs and fixtures for all the parts so as to build it cheap. But he used up all his capital before he had sold a planer, and the sheriff got him."

Is Al right as to the economy of fixtures? Or is it wiser to invest in more of them?

Discussion

Trade Schools

Since there is considerable detail work involved in a foreman's duties he does not have time to teach apprentices properly. Teaching a vocation requires much personal attention and patience, and it is certain that if a foreman exercises these qualities his specific duties will be interfered with.

Being a former student of a vocational school, I became interested in the relative merits of the shop-trained mechanic and the product of the trade school. I am convinced that if a shop-trained mechanic does not give considerable study to his shop work, he does not compare with the school-trained product. At a vocational school the students are taught mathematics, practical physics, drawing and the elements of metallography. They are taught to take pride in the appearance and accuracy of their work and are given ample time to do it, since production is of secondary importance.

When a student in machine shop practice graduates from a trade school he should not consider himself to be a machinist or a toolmaker. Though he has gained a solid foundation for his trade, it will take a few years in the factory before he grasps the specialized requirements and gets a fair degree of speed essential for production. Many factories have curtailed the training of apprentices and the trade school is the only source of supply of trained boys; therefore no attempt should be made to discourage young men and boys from learning a trade. —Peter L. Budwitz.

Personally, I sort of lean toward the apprenticeship method of training, probably because that is the way I learned my trade. As to doing the dirty jobs around the shop, we spent our first six months of apprenticeship making repairs to diesel engines, water wheels, motors and power presses; lining shafting, installing new machines and, of course, snagging castings. But I just took the dirty work as part of the trade, because the machinist trade is not exactly a white collared one.

I have had some experience with trade-school pupils who came into the shop for part of their instruction and I

quite often found that I had to "unteach" them some of the things they had been taught in school. Perhaps that has colored my opinion of trade schools. However, it does seem to me that given a teacher who really knows something about machines and tools, who likes boys and who has a lot of patience with them, a trade school well might be a great help in training future machinists.

Certainly, unless some way is found to train boys and to make the work so interesting to them that they will want to follow up the trade, we will have a shortage of skilled, all around machinists in a few years and the trade will be given over to specialists.

—Hugh M. Mitchell.

Whether or not the apprentice makes a successful mechanic depends on his aptitude in learning and his love of the trade. A course in a trade school for a young man who is sincere in his efforts to become a mechanic is a wonderful thing, but without the benefit of actual shop practice under everyday conditions he will not derive much benefit from it. There are many things a trade school can teach better and more thoroughly than can a foreman in the shop, for he usually is too busy to stop and explain every job and every move in detail as required for proper instruction.

Mathematics and mechanical drawing are subjects that are quite important to the mechanic, and no one will deny that they can best be taught in a trade school, the classes in which are usually conducted by men who have had practical experience and who understand just what is of the greatest benefit and importance to the student.

In the past, one of the reasons why young men hesitated to learn a trade was because they had to bind themselves for so long a time; usually three or four years. If more factories would cooperate a little closer with the trade schools, the term of apprenticeship could be shortened considerably, thereby making it easier to induce young men to undertake to learn a trade.

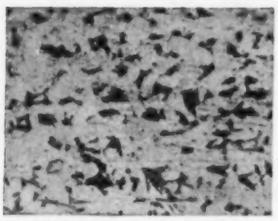
—Robert Knotek,
Assistant Toolroom Foreman,
Fisher Body Corporation.

Building a machine is the practical application of certain fundamental processes. An apprentice has two things to learn; one, the skillful performance of the elements of machine work; and the other, the application of these elements to production. The former is better and more quickly learned in a trade or vestibule school, while the latter can be learned only by contact with industry.

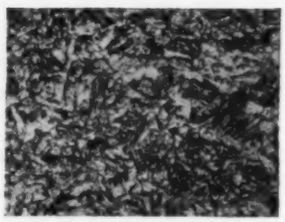
It is not difficult to teach an intelligent boy how to drill, bore, chase threads or cut gears, and with a reasonable amount of diligent practice, skill in performing these operations is readily acquired. To teach the boy how to apply these fundamentals is next to impossible. They must be learned in the industrial school of "hard knocks."

It would seem then that the skilled mechanics of the future can be trained more quickly and efficiently by a period of trade school training followed by a period of industrial training. More quickly because the boy would not be subjected to the usual drudgery the first year or so, as in the old apprenticeship days. More efficiently because the boy would observe more diligently and could more readily

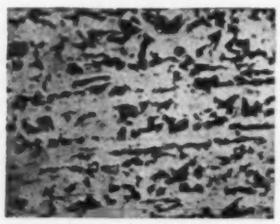
WYCKOFF
Controlled
MANGANESE STEELS



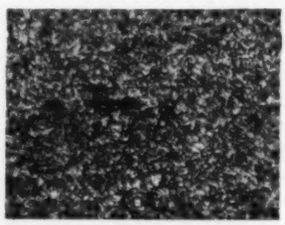
Uncontrolled Steel — magnification 67 x—etched.



Wyckoff Controlled Manganese Steel as rolled — Magnification 67 x — etched.



Uncontrolled Steel, cooled rapidly in air from 1900° F.



Wyckoff Controlled cooled rapidly in air from 1900° F.

In a recent series of tests conducted by a large eastern manufacturer, interested in obtaining a steel that would give maximum results in both uniformity and machinability, Wyckoff Controlled Manganese Steel, proved conclusively its superiority over the steels heretofore used as shown in the illustrations above.

In these tests, the superior machinability of Wyckoff Controlled Manganese Steel and its close grained structure were outstanding. After machining, it was further subjected to heating in Cyanide at 1450° F. and quenched in oil, definitely proving that its fine grain characteristics insured the MINIMUM amount of distortion.

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grasp the meaning of orders given him without taking the time of the foreman for explanations.

Being a teacher and knowing that interest is one of the prerequisites to learning, I assume that the boy's chief interest is in learning to become a skilled mechanic. —O. D. Rickly,
Asst. Professor of Industrial Engineering, Ohio State University.

Codified Skill

By all means the higher-skilled artisans should be codified. Honest industry has all classes codified or classified as to rates of pay, and in normal times it is adhered to. No sane executive would employ a machinist and classify him as a toolmaker or a diemaker and pay him the higher rate of wages. Yet at this time there are many chiseling firms employing machinists having diemaking experience and paying them machinist's wages. In order to be employed under this classification the applicant must in reality be a diemaker, although he gets the pay of a machinist. Draftsmen are being employed as clerks having some drafting experience.

Under a fair and proper code for the higher-skilled artisans, an employer should be obliged to employ machinists for machine work, toolmakers for tool work, diemakers for die work and to pay them wages that the code calls for, instead of employing specialists under a lower classification and rate of pay.

On the other hand, it should be obligatory for a person seeking employment under a code classification of the higher-skilled ruling to be apt and capable, as the code should specify.
—W. E. Fischer.

Shop Instructions

The applicability of instruction sheets is less affected by the size of the shop than it is by the nature of the work the shop handles. By that is meant that in a shop where the work is standard and must positively follow the same route in machining and assembly, the ideal manner of handling is a thing that may be approached, if not definitely arrived at. It follows that instructions may be profitably issued in sheet form.

Ed has considerably warped ideas with reference to the instruction sheet being absolutely inalterable and ironclad, and so to consider it would largely defeat the very purpose for which it was conceived. It is true that compliance with the instruction sheet must be insisted upon, but in the shop where management is wise it will be common knowledge that instruction sheets are subject to revision at stated periods, if and as better methods and ideas are forthcoming.

In the shop where custom work is handled, either entirely or in part, the situation is different, but so long as a certain part is standard, instruction sheets will be profitably applicable to that part. In the very nature of the case, management must, of course, reserve all rights as to where instruction sheets will and will not be used, and as to when and how they shall or shall not be changed. —John E. Hyler.

When work is repeated and there is no record of how it was previously done, methods are entirely dependent upon the memory of the foreman or of the man doing the job. If the job has not been done for some time, it

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often means that methods that were discarded long ago will be used again. If instruction sheets are used, even a new man can do the job according to the best production methods. Instruction sheets are of equal value to the experienced man having ideas of his own and to the average man who would rather work to instructions than to try to find a better way of doing the job.

By following the instruction sheet, the experienced man will avoid mistakes that had been made before he got on the job, and he has a foundation for developing better ways. The production of the inexperienced man will undoubtedly be much greater if he works according to an instruction sheet that has been developed over a period of years than if he were left to be guided by his own experience.

The instruction sheet should not be accepted as an ironclad rule, but as a record of the best way known at the time to do the job. When improved methods are known, the instruction sheet should be revised to agree with them.

—Nils H. Lou.

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• TRADE • PUBLICATIONS

Abrasive Band Grinders. Nine models of abrasive band grinders are discussed in a publication issued by the Walls Sales Corp., 96 Warren St., New York, N. Y. Specifications and illustrations are given for each model.

Boring Machine. A folder recently published by the Stokerunit Corp., 5325 W. Rogers St., Milwaukee, Wis., introduces its simplex precision boring machine. The machine is described in detail.

Bronze Bushings and Bearings. The Johnson Bronze Co., New Castle, Pa., has prepared a stock list giving the dimensions and weights of its line of bronze bushings and bearings. The publication is known as Bulletin No. 340.

Draw-Cut Machine Tools. In Bulletin No. 25, the Morton Manufacturing Co., Muskegon Heights, Mich., presents a line of draw-cut machine tools for railroad shops. The various types and sizes of machines are illustrated.

Hand Trucks. The Fairbanks Co., 393-399 Lafayette St., New York, N. Y., has issued a catalog describing its new No. 9000 line of hand trucks. Dimensions and weights are given for 27 models.

Machine Shop Tools. In a 240-page catalog B-35, the Armstrong Bros. Tool Co., 317-357 North Francisco Ave., Chicago, Ill., describes its line of tool holders, pipe tools, drop forged clamps, and wrenches. Many new items are listed. Specifications and prices are given.

Mill Supplies and Contractors' Specialties. The Greene, Tweed Co., 109 Duane St., New York, N. Y., has put out a booklet describing its different types of piston rod packing, Basa soft-faced hammers, and reversible ratchet wrenches. Other specialties are included.

Plate and Sheet Metal-Working Machinery. The Streine Tool & Mfg. Co., Minster, Ohio, has put out a booklet presenting its line of plate and sheet working machinery. The booklet contains illustrations of the various machines and tables giving data on sheet metals.